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Volume XXXI MARCH, 1941 No. 1

Foreword to Historical Geography*

CARL O. SAUER

APOLOGIA

These remarks are directed to the nature of historical geography and to some of its problems. By preference I should present data and conclusions from my own work in Mexico. On second thought, however, I am moved to do what has been done so often in the annual address before this body, to set forth in some manner a confession of the faith that has stood behind one's work.

It is obvious that we who call ourselves geographers do not at present understand each other very well. We have more fraternal feeling of belonging together than common intellectual ground, on which we meet freely and easily. We can hardly claim to be getting our chief intellectual stimulus from one another, to be waiting impatiently on the research of colleagues as needed for our own work. We are of various minds as to the fields in which we are engaged. As long as we are in such a condition of uncertainty about our major objectives and problems, attempts must be made from time to time to give orientation to ourselves along a common course.

AN AMERICAN RETROSPECT

This will not be another design for the whole of geography, but a protest against the neglect of historical geography. In the nearly forty years of existence of this Association, there have been but two presidential addresses

* Presidential address delivered before the Association of American Geographers at Baton Rouge, Louisiana, December, 1940.

that have dealt with historical geography, one by Ellen Semple, and one by Almon Parkins.

A peculiarity of our American geographical tradition has been its lack of interest in historical processes and sequences, even the outright rejection thereof. A second peculiarity of American geography has been the attempt to slough off to other disciplines the fields of physical geography. Hartshorne's recent methodologic study is an interesting illustration of both these attitudes. In spite of basing himself strongly upon Hettner, he does not take into account the fact that Hettner's own contributions to knowledge have been chiefly in the field of physical geography. Nor does he follow Hettner into his main methodologic position, namely that geography, in any of its branches, must be a genetic science, that is, account for origins and processes. Hettner's students have made many of the important contributions of late years to historical geography. Hartshorne, however, directs his dialectics against historical geography, giving it tolerance only at the outer fringes of the subject. I have cited this position because it is the latest and, I think, best statement of what is in fact, if not by avowal, a pretty general view-point in this country.

Perhaps in future years the period from Barrows' *Geography as Human Ecology* to Hartshorne's late résumé will be remembered as that of the Great Retreat. This retraction of lines began by the pulling apart of geography from geology. Geography, of course, owes its academic start in this country to the interest of geologists. Partially in order to gain administrative independence in the universities and colleges, geographers began to seek interests that geologists could not claim to share. In this process, however, American geography gradually ceased to be a part of Earth Science. Many geographers have completely renounced physical geography as a subject of research, if not entirely as one of instruction. There followed the attempt to devise a natural science of the human environment, the relationship being gradually softened from the term "control" to "influence" or "adaptation" or "adjustment" and finally to the somewhat liturgical "response." Methodical difficulties in finding such relationships led to a further restriction, to a non-genetic description of the human content of areas, sometimes called chorography, apparently in the hope that by and by such studies would somehow add up to systematic knowledge.

This thumb-nail sketch of our generation, as to its dominant motifs, is simplified but, I hope, not distorted. Throughout this time, the desire has been to limit the field in order to secure its domination. There has been the feeling that we were too few and weak to do all the things which had been done in the name of geography and that a sufficient restriction would mean better work and the freedom from trespass quarrels.

Whichever way he has turned, the American geographer has failed to locate the uncontested field in which only professionally certified geographers might be found. Sociologists have been swarming all over the precincts of human ecology. Odum and his North Carolina associates have been exploring with success the connotations of region and regionalism. Economic geography has been approached from new angles by economists like Zimmermann and McCarty. Land planning can certainly not be claimed as the geographer's discipline, nor as a discipline in any sense, since it must obviously be primarily projected from a specific theory of the state. These errant years have not led us to the desired refuge. We shall not find our intellectual home in this sort of movement away from our heritage.

The American geography of today is essentially a native product; predominantly it is bred in the Middle West, and, in dispensing with serious consideration of cultural or historial processes it reflects strongly its background. In the Middle West, original cultural differences faded rapidly in the forging of a commercial civilization based on great natural resources. Perhaps nowhere else and at no other time has a great civilization been shaped so rapidly, so simply, and so directly out of the fat of the land and the riches of the subsoil. Apparently here, if anywhere, the formal logic of costs and returns dominated a rationalized and steadily expanding economic world. The growth of American geography came largely at a time when it seemed reasonable to conclude that under any given situation of natural environment there was one best, most economical expression of use, adjustment, or response. Was not the Corn Belt *the* logical expression of soil and climate of the prairies? Did not its capital, Chicago, show in the character and energy of its growth the manifest destiny inherent in its position at the southern extremity of Lake Michigan, toward the eastern margin of the Prairies? Did not the green sea of corn that overwhelmed the native prairie grasses represent an ideal realization of most economical use of a site, as did the bending of the strands of communication to meet at the dynamic center of Chicago? Here the growth of centers of heavy industry at points of most economic assembly of raw materials was an almost mathematical demonstration of function of ton-miles, somewhat conventionalized in terms of freight rate structures.

And so, in the simple dynamism of the Mid-West of the early Twentieth Century, the complex calculus of historical growth or loss did not seem particularly real or important. Was it, in view of such "rational" adjustment of activity and resource, being very realistic to say that any economic system was nothing but the temporarily equilibrated set of choices and customs of a particular group? In this brief moment of fulfillment and ease, it seemed that there must be a strict logic of the relationship of site and satis-

faction, something approaching the validity of natural order. Do you remember: the studies that related land use to numerical sums expressing natural environment, that related intensity of production to market distance, that planned the "best" future use of land and "most" desirable distributions of population? Actors in the last scenes of a play that had begun in the early Nineteenth Century, they were largely unaware that they were part of a great historic drama. They came to think that human geography and history were really quite different subjects, not different approaches to the same problem, the problem of cultural growth and change.

For those who would not follow in this train, the last twenty years of American geography have not been heartening. Those who found their work in fields of physical geography often have felt themselves scarcely tolerated. Particularly depressing has been the tendency to question, not the competence, originality, or significance of research that has been offered to us, but the admissibility of work because it may or may not satisfy a narrow definition of geography. When a subject is ruled, not by inquisitiveness, but by definitions of its boundaries, it is likely to face extinction. This way lies the death of learning. Such has been the lingering sickness of American academic geography, that pedantry, which is logic combined with lack of curiosity, has tried to read out of the party workers who have not conformed to prevalent definitions. A healthy science is engaged in discovery, verification, comparison, and generalization. Its subject matter will be determined by its competence in discovery and organization. Only if we reach that day when we shall gather to sit far into the night, comparing our findings and discussing all their meanings shall we have recovered from the pernicious anemia of the "but-is-this-geography" state.

A THREE-POINT UNDERPINNING FOR GEOGRAPHY

The business of becoming a geographer is a job of life-long learning. We can teach a few skills such as the making of maps of various kinds, but, mostly, in the instructional period, the best we can do is to open doors for the student.

1. One of these, which is not sufficiently often thrown wide, is that of the history of Geography. There is available a fine and great intellectual heritage to us. This is not simply the study of our subject as it has shaped up at various periods of its history, though this is stimulating enough. No one is likely to regret, for instance, becoming familiar with Greek thought in geography, as a background for his own thinking. Of especial value, however, to the development of the student is the first-hand study of the individual great and genial figures of our past. A student can hardly immerse himself for a period in following through the intellectual history of a

Ritter or Humboldt without seeing wide horizons open up. This sort of thing, however, involves learning to know these men through the whole range of their work, not by way of some one else's critique. A good knowledge of the work of one or more of our major personalities is about as important an induction into geography as I am able to suggest.

The list of these will vary with individual opinion. I should, however, like to bespeak a place on this shelf of classics for Eduard Hahn, as well as for Ratzel. Ratzel is best known to us, and that mostly at second hand, for the first volume of his *Anthropogeographie*. There is far more in the unknown Ratzel than in the well publicized one. Hahn is our forgotten classic. For the view-point that I wish to develop in later paragraphs, he is perhaps the most important person in our history. At this point, I shall simply submit the opinion that Hahn made of economic geography an historical science, that he opened up unimagined vistas of the origin and spread of cultures, and that he penetrated farthest, as well as first, into the concept of the economic region. From England I should like to nominate Vaughan Cornish and from this country George Marsh for full length biographical inquiry. The half dozen names offered will in themselves provide a truly liberal geographic education, provided each is taken as a whole, and not skimmed eclectically in terms of pre-arranged views as to what is and is not geographic.

2. American geography cannot dissociate itself from the great fields of physical geography. The ways that Davis, Salisbury, and Tarr so clearly marked out must not be abandoned. A geographer, I submit, may properly be a student of physical phenomena without concerning himself with man, but a human geographer has only limited competence who cannot observe as well as interpret the physical data that are involved in his studies of human economies. It is a puzzling fact that American environmentalists have reduced attention to surface and soils, to climate and weather to most inadequate terms, whereas those who see in geography more than the relation of man to environment have continued to support by inquiry these physical observations. In addition, climatology, ecology, and geomorphology serve important methodologic purposes as disciplines of observation, the techniques of which may be applied to human geography.

3. Lastly, the human geographer should be well based on the sister discipline of anthropology. Ratzel elaborated the study of cultural diffusions which has become basic to anthropology, both as a means of inspection and as theory. This is essentially a geographic method. Its influence can be traced as a dominant theme through anthropology for the past half century, down to the current concern with the *Kulturkreis* and "culture area" concepts. Swedish geography gains part of its strength from the formal

association with anthropology in the joint national society. In England the influence of Fleure and Sir Cyril Fox is that of a bond between both disciplines, strongly shown by the active generation of geographers in that country.

Methodologically, anthropology is the most advanced of the social sciences, and one of its best developed methods is that of geographic distribution. Sten De Geer's essay on the nature of geography is *de facto* a statement of a method in continuous use in anthropology. The forms of material culture with which the anthropologist deals are identical with those of human geography. His observations of culture traits, his synthesis of these into culture complexes or areas are, or should be, entirely familiar to us. His use of occurrences, discontinuities, losses and origins of culture traits in terms of their localization as diagnostic of what happened to a culture is actually a mode of geographic analysis for genetic ends. It is precisely the same method of inferring cultural movement from distributions that August Meitzen introduced into continental historical geography many years ago. It is also used in plant and animal geography to trace dispersals, retreats, and differentiations.

THE GEOGRAPHIC METHOD: TERRESTRIAL LOCALIZATION

The ideal formal geographic description is the map. Anything that has unequal distribution over the earth at any given time may be expressed by the map as a pattern of units in spatial occurrence. In this sense geographic description may be applied to an unlimited number of phenomena. Thus there is a geography of every disease, of dialects and idioms, of bank failures, perhaps of genius. That such form of description is used for so many things indicates that it provides a distinctive means of inspection. The spacing of phenomena over the earth expresses the general geographic problem of distribution, which leads us to ask about the meaning of presence or absence, massing or thinning of any thing or group of things variable as to areal extension. In this most inclusive sense, the geographic method is concerned with examining the localization on the Earth of any phenomena. The Germans have called this the *Standortsproblem*—the problem of terrestrial position—and it represents the most general and most abstract expression of our task. No one has yet written this philosophy of geographic localization, but we all know that this is what gives meaning to our work, that our one general problem is in the differentiating qualities of terrestrial space. Might one hazard the statement that in its broadest sense the geographic method is concerned with terrestrial distance? We are not concerned with universalized economic man, family, society, or economy, but with the comparison of localized patterns, or areal differentiations.

THE CONTENT OF HUMAN GEOGRAPHY

Human geography, then, unlike psychology and history, is a science that has nothing to do with individuals but only with human institutions, or cultures. It may be defined as the problem of the *Standort* or localization of ways of living. There are then two methods of approach, one by the study of the areal extension of individual culture traits and one by the determination of culture complexes as areas. The latter is the general objective of these continental geographers who speak of *genre de vie* and of the English who lately are using the term "personality" as applied to a land and its people. Much of this sort of inquiry lies as yet beyond any systematic means of development.

We have available, however, an immediately useful restriction to the material culture complex that is expressed in the "cultural landscape." This is the geographic version of the economy of the group, as providing itself with food, shelter, furnishings, tools, and transport. The specific geographic expressions are the fields, pastures, woods, and mines, the productive land on the one hand, and the roads and structures on the other, the homes, workshops, and storehouses, to use the most generic terms (introduced mainly by Brunhes and Cornish). Though I should not argue that these terms include all of human geography, they are the core of the things that we know how to approach systematically.

THE HISTORICAL NATURE OF CULTURE

If we are agreed that human geography is concerned with the areal differentiation of human activities we are at grips at once with the difficulties of environmentalism. Environmental response is the behavior of a given group under a given environment. Such behavior does not depend upon physical stimuli, nor on logical necessity, but on acquired habits, which are its culture. The group at any moment exercises certain options as to conduct which proceed from attitudes and skills which it has learned. An environmental response, therefore, is nothing more than a specific cultural option with regard to the habitat at a particular time. If we may redefine the old definition of man's relation to his environment as the relation of habit and habitat, it is clear that the habitat is revalued or reinterpreted with every change in habit. Habit or culture involves attitudes and preferences, which have been invented or acquired. There is no general environmental response in the wearing of straw hats. In Chicago they may belong to the summer wardrobe of the well-dressed man. In Mexico they are the distinctive badge of the *peón* in all weather, and the unmodified Indian wears no hat at all. Like every other culture trait, the straw hat depends on the acceptance by a group of an idea or mode, which may be suppressed or sub-

stituted by another habit. The design of science that Montesquieu, Herder, and Buckle forecast, failed because we know that natural law does not apply to social groups, as Eighteenth Century Rationalism or Nineteenth Century Environmentalism had thought. We have come to know that environment is a term of cultural appraisal which is itself a "value" in culture history.

We know that habitat must be referred to habit, that habit is the activated learning common to a group, and that it may be endlessly subject to change. The whole task of human geography, therefore, is nothing less than comparative study of areally localized cultures, whether or not we call the descriptive content the cultural landscape. But culture is the learned and conventionalized activity of a group that occupies an area. A culture trait or complex originates at a certain time in a particular locality. It gains acceptance, that is, is learned by a group, and is communicated outward, or diffuses until it encounters sufficient resistance, as from unsuitable physical conditions, from alternative traits, or from disparity of cultural level. These are processes involving time and not simply chronologic time, but especially those moments of culture history when the group possesses the energy of invention or the receptivity to acquire new ways.

HUMAN GEOGRAPHY AS CULTURE-HISTORICAL GEOGRAPHY

The culture area, as a community with a way of living, is therefore a growth on a particular "soil" or home, an historical and geographical expression. Its mode of living, economy, or *Wirtschaft,* is its way of maximizing the satisfactions it seeks and of minimizing the efforts it expends. That is perhaps what adaptation to environment means. In terms of its knowledge at the time, the group is making proper or full use of its site. However, these wants and efforts need not be thought of in monetary or entirely in energy terms, such as units of labor performed. I daresay that every group of men has built its habitations in the spot that for them has been most suitable. Yet to us (that is, for our culture) many such sites appear queerly selected. Therefore, as preliminary caution, every culture or habit must be appraised in terms of its own learning, and also habitat must be viewed in terms of the occupying group. Both requirements place a severe tax on our ability as interpreters.

Every human landscape, every habitation, at any moment is an accumulation of practical experience and of what Pareto was pleased to call residues. The geographer cannot study houses and towns, fields and factories, as to their where and why without asking himself about their origins. He cannot treat the localization of activities without knowing the functioning of the culture, the process of living together of the group, and he cannot do this except by historical reconstruction. If the object is to define and understand human associations as areal growths, we must find out how they and

their distributions (settlements) and their activities (land use) came to be what they are. Modes of living and winning a livelihood from their land involves knowing both the ways (culture traits) they discovered for themselves, and those they acquired from other groups. Such study of culture areas is historical geography. The quality of understanding sought is that of analysis of origins and processes. The all-inclusive objective is spatial differentiation of culture. Dealing with man and being genetic in its analysis, the subject is of necessity concerned with sequences in time.

Retrospect and prospect are different ends of the same sequence. Today is therefore but a point on a line, the development of which may be reconstructed from its beginning and the projection of which may be undertaken into the future. Retrospection is concern with origins, not antiquarianism, nor do I have sympathy with the timorous view that the social scientist may not venture to predict. Knowledge of human processes is attainable only if the current situation is comprehended as a moving point, one moment in an action that has beginning and end. This does not involve commitment as to the form of the line, as to whether it has cyclic qualities or shows no regularity, but it does guard against over-emphasizing the importance of the current situation. The only certain advantage of studying the present scene is that it is most fully accessible to inspection. Yet out of the contemporary data in themselves it is not possible to find the means of selecting what is diagnostic of important process, and what is not. I am inclined to say that geographically the two most important events of my life-time have been the settlement of the last of the prairie lands and the coming of the Model T Ford, one an end, the other a beginning of a series of cultural processes. Yet how well did we, whose business it was to do so, pick out these critical processes at the time of their happening, or link them with the changes derived from them? And why did we miss them, if not because we were unaccustomed to think in terms of processes?

HISTORICAL GEOGRAPHY DEMANDS REGIONAL SPECIALIZATION

The reconstruction of past culture areas is a slow task of detective work, as to the collecting of evidence and weaving it together. The narrative historian may accept anything out of the past as grist at his mill, but not so the culture historian, and I wish to reckon historical geography as a part of culture history. Our obligation is to glean classified data on economy and habitation so that a valid filling of gaps of area and of time can be made. Let us take, for example, the reconstruction of Mexico at the moment of the Spanish conquest. Here we need to know as well as is possible the early Sixteenth Century distribution of population, urban centers, urban economies, types of agriculture, sources of metal and stone, provision of plant and

animal materials from wild lands, and lines of communication. The early authors who drew a picture of pre-Spanish, as against Spanish conditions, such as Torquemada's famous Monarquia Indiana, unfortunately made general, rather than localized statements, or took a situation that was true of one place and applied it as though it was general. One cannot rely, therefore, on most of the accounts that were intended to be synoptic, but must turn to the minor records that give local data. The reconstruction of critical cultural landscapes of the past involves a) knowledge of the functioning of the given culture as a whole, b) a control of all the contemporary evidences, which may be of various kinds, and c) the most intimate familiarity with the terrain which the given culture occupied.

The historical geographer must therefore be a regional specialist, for he must not only know the region as it appears today; he must know its lineaments so well that he can find in it the traces of the past, and he must know its qualities so well that he can see it as it was under past situations. One might say that he needs the ability to see the land with the eyes of its former occupants, from the standpoint of their needs and capacities. This is about the most difficult task in all human geography, to evaluate site and situation, not from the standpoint of an educated American of to-day, but to place one's self in the position of a member of the cultural group and time being studied. It is, however, a rewarding experience to know that one has succeeded in penetrating a culture that is removed in time or alien in content from ours.

Such work obviously cannot be done by sample studies ranging widely, but may require a life-time given to learning one major context of nature and culture. One may thus extend his learning outward to the limits of a culture area and explore the contrasts on the other side of the boundary line. Or one may undertake excursions to areas characterized by important kindred qualities. But always there must be the base of the area for which the observer is making himself the expert. The human geographer cannot be a world tourist, moving from people to people and land to land, and knowing only casually and doubtfully related things about any of them. I doubt whether a human geographer can ever be a continental authority. Should we not get rid of the habit of writing regional textbooks about areas we don't know, with materials we copy from secondary sources that we are unable to evaluate? Nor are a thousand so-called type studies, individually quasi-photographic records of spots on the earth, likely to add up to anything significant. We recognize expertness among ourselves in physical geography, but do we have anything of the sort in human geography? If we do not, is not the difficulty that we have been concerned with non-genetic forms of presentation rather than with intensive and analytical

observation? We have a full company of Ph.D.'s duly trained in human geography, teaching hundreds of classes to thousands of students, but how little are they adding to the substance of the science they represent!

Historical regional studies of the manner indicated are in the best and oldest geographic tradition. Cluverius in the Seventeenth Century did some extraordinarily acute reconstructions of ancient Germany and Italy, skillfully uniting knowledge of the classics and knowledge of the land. Humboldt's *Essay on New Spain* is still the classic of historical geography on Mexico. The stimulus of Humboldt and Ritter was pointed up through the work of Meitzen in the mid-Nineteenth Century into an adequate discipline of historical geographic study. Meitzen's approach affected all continental geography greatly. Historical regional specialization is well expressed in the great repository of the *Forschungen zur Deutschen Landes- und Volkskunde*. The influence of Fleure and Miss Taylor is evident in the studies of the younger English geographers. It is about time that we in this country become actively conscious of this, the great tradition in human geography.

THE NATURE OF THE CULTURE AREA

In all regional studies—and we equate regional geography and historical geography—a serious problem is in the definition of the term "area." There has been so much inconclusive discussion of the term "region" or "area" that apparently no one definition suffices.

Most commonly the attempt has been to proceed from the "natural area." Yet it is hard to know what constitutes a natural area, unless it be an island, for climates, land forms, and soil provinces are likely to diverge widely. Hence the preference for the study of islands and areas that simulate insular conditions in their sharpness of outline. If we can agree on what is a natural region, we are still faced by the fact that cultural units are likely to straddle the boundary zones of physical contrasts. Boundaries rather than centers of physical regions are likely to be centers of culture areas.

We often employ the term "natural region" to designate any areal division of simple habitat qualities that may facilitate study by reducing complexity. Quite subjectively we indicate that "natural" region A is a coniferous forest land, that region B is characterized by a certain climate, that area C is a land of mountains, that region D is a province of coal and oil. Consistently we mix terms in designating natural regions, selecting a major quality of habitat for each. We are therefore likely to conceal, rather than to answer, the dilemma of area by calling it a natural unit.

In human geography we are mainly interested in the connotation of the cultural area. The unit of observation must therefore be defined as the area over which a functionally coherent way of life dominates. The most satis-

factory illustration we have to date is in Eduard Hahn's basic economic regions of the world. We are, however, still far from knowing how to determine a culture area beyond saying that it has intimate interdependence of living. Nevertheless we have a simpler task than the anthropologist in his all-inclusive culture areas, though perhaps we too in the end must build up our areas by finding a sufficient accordance of common traits. A culture area of one order may be recognized by the dominance of a single economic complex. A culture area of a superior order may be determined by the interdependence of a group of areal economies. The traits of making a living for us are the dominant things to observe. Until we know much more about them we do not need to concern ourselves much with other qualities of culture.

Economic areas rarely have fixed or sharp boundaries. Historically they may experience shifts of centers, peripheries, and changes of structure. They have the quality of gaining or losing territory and often of mobility of their centers of dominance. They are fields of energy, within which changes in dynamism may show characteristic directional shifts. It is also possible to imagine a culture area which in the course of time shifts away completely from an earlier location and still maintains organic continuity.

We are interested in the origin of a cultural system as to place of birth. This we may call the theme of the culture hearth, the inquiry into the localization of culture origins. The classical formulation of the problem still is that of the places of origin of agricultural systems. Next, we are concerned with the energy that a growing culture shows as to manner and rate by which it occupies land, including the nature of the extending frontiers. Next, we are interested in the manner of stabilization of one culture area against another. Finally there are the problems of decline or collapse and of succeeding cultures. The homologues of all these questions are well known from plant ecology in the study of plant societies.

THE RELEVANCE OF ALL HUMAN TIME

A dissent may now be registered against that view of geography which considers geography as exclusively or peculiarly concerned with present economies or cultures. One of the fundamental questions in all social study is how to account for the rise and loss of institutions and civilizations. The birth or fall of a great state or culture will always claim the attention of students of civilization. One is no less a geographer if he is engaged in knowing the rise and passing of a culture that lies back at the dawn of history, than if he is concerned with the growth of industrial Chicago. There may be as important things to learn about human geography in the archeology of the Mississippi Delta as in its fields of sugar cane. Any topic in

the social sciences is important, not by reason of its date, but by the light it throws on the nature of culture origins and changes. This assertion is basic to the present position. If it is correct, all human time is involved in the field, and any predilection to consider the present as intrinsically most important misses the expressed aim of human geography as a genetic science.

Here and there geographers have concerned themselves with prehistoric settlements and culture. In Louisiana, Kniffen and Ford are providing a good illustration of what may be learned by archeo-geographic study. There is, indeed, a specifically geographic dimension to archeology, that of the complete distribution of the traces of a culture, so as to reconstruct its population pattern and its economic geography. Even in our best known area, that of Pueblo culture, this approach has been carried out only once, by Colton and his associates at the Flagstaff Museum, an approach which I should like to recommend as a model of workmanship. English geography is today most largely indebted to Fleure, who has concerned himself primarily with the farthest corridors of time. In this field there is hardly a question of continuity with the present culture area, but an approach to the general problem of the specialization and viability of culture. To some of us, at least, the geography of Basketmaker Man or of the Bell-Beaker Folk is as revealing and absorbing as anything in the present-day world. Those of us who are completely historical geographers are concerned with human origins and changes throughout all human time. Let no one think, therefore, that we are in any sense off-side from the main theme if we work at the farthest reaches of time, the childhood of our race. We think rather, that the human geographer who works on the short-time dimension of the contemporary scene is held by a peculiar obsession.

THE ARCHIVE IN HISTORICAL GEOGRAPHY

The first step in reconstruction of past stages of a culture area is mastery of its written documents. The discovery of contemporaneous maps is the first thing hoped for, but rarely realized. We have, however, scarcely exploited the documentary possibilities in the United States of old land surveys as to notations on the character of vegetation and of "improvements" early in the period of settlement. There is a fair amount of valuable material in the Land Office plats and in the older records of land grants that give glimpses of the pioneer landscape. Factual data, precisely localized, of enumerations of persons and goods, of land titles, assessments, production, lie neglected in various archives to await exploitation. There is an embarrassment of such riches in the old Spanish records for New Spain, from parish records up to summary reports that were sent to the king in Spain. There are diaries and accounts of early explorations, the *visitas* made by

inspecting officials who reported in detail on condition of the country, letters of missionaries, the so-called geographic relations ordered for all Spanish America at several times in the Sixteenth and Eighteenth Centuries, records of payments of taxes and tributes, data on mines, salines, and roads. Perhaps no other part of the New World has as elaborate a documentation on settlements, production, and the economic life of every part as do the Spanish colonies, but it is certainly an exceptional area for which documentary sources will not yield a large part of the data needed to reconstruct the geographic pattern of living through successive stages of its history. Familiarity with such records, however, takes much time and search.

FIELD WORK IN HISTORICAL GEOGRAPHY

Let no one consider that historical geography can be content with what is found in archive and library. It calls, in addition, for exacting field work. One of the first steps is the ability to read the documents in the field. Take into the field, for instance, an account of an area written long ago and compare the places and their activities with the present, seeing where the habitations were and the lines of communication ran, where the forests and the fields stood, gradually getting a picture of the former cultural landscape concealed behind the present one. Thus one becomes aware of nature and direction of changes that have taken place. Questions begin to take shape as to what has happened to local site values. It is real discovery thus to take old documents into the field and relocate forgotten places, to see where the wilderness has repossessed scenes of active life, to note what internal migrations of inhabitants and of their productive bases have occurred. There comes a time in such study when the picture begins to fit together, and one comes to that high moment when the past is clear, and the contrasts to the present are understood. This, I submit, is genetic human geography.

This may be hard and often difficult work physically, because there are trails that must be followed if one is to get the answers. One must go over the ground of former activity, no matter what its present accessibility or facilities, or lack thereof, for the comfort and health of the student. It isn't a question of learning to know a country by modern means of transport. There is an exaction of intimacy with out-of-the-way places which historical geography often imposes that modern economic geography does not do. This sort of inquiry demands that the field worker go where the evidence requires him to go. Hence the importance of those brief and precious younger years when he is physically able to follow his clues through the chosen area. There are all too few field seasons that will be available to him. At best, when the days of insufficient physical strength come upon him, he will wish that he had been in the field longer and more often, to secure the observations which he needs.

The first objectives of historical field work are to value the habitat in terms of former habit, and to re-locate the former pattern of activity as indicated in the documentary record. To these are added more specific tasks of field observation. The chief of these may be called the location of the cultural relicts and fossils.

Cultural relicts are surviving institutions that record formerly dominant, but now old-fashioned conditions. Familiar illustrations are 1) types of structures, 2) village plans, and 3) field patterns surviving from former days. Every student of European geography knows how house type, settlement plan, field systems have yielded knowledge of the spread of different kinds of settlement forms, often where the written record is silent. Scofield, Kniffen, and Schott have well shown how such data may be used in this part of the world. 4) Some of us have been engaged in tracing the distributions of varieties of native crop plants as indicators of cultural spreads. Similar work remains to be done with Old World plant and animal domesticates to trace routes of cultural dissemination. 5) Little has been done in the study of old forms of plant and animal husbandry. We lack inquiries into native hoe husbandry or *milpa* agriculture, into old traits of backwoods farming still surviving among us, into the old basic elements of our stock ranching, into the historic functions of the barn, into types of different immigrant agricultures. Such type studies, recording in faithful detail the year-round calendar of old-fashioned agricultural communities, would be of great value, especially if they can be carried out so as to show what modifications have come in with time. 6) Similarly, there still are archaic forms of placer, pit, and even lode mining, and 7) old ways of felling lumber and getting out logs. All such archaisms which help to understand former processes operative in localizing settlement and use of resource should be recorded while they still exist. 8) The old-fashioned water and animal-powered mills, and 9) the survival of old transport methods by water and land are other instances in point.

It may be objected that such inquiries are technologic and not geographic. However, every organized activity is a skill that has been learned or developed by a group or community, without the understanding of which the geographer cannot interpret the productive occupation of his area. If there is no such thing as direct adaptation in human geography, there can be no human geography that does not concern itself with communities as associations of skills. The field geographer then must observe the expression of such skills in the cultural objectives of a group occupying a given site, and the historical geographer must recover the survivals of old skills that explain older dominant forms of land occupation.

Moreover, the geographer as field worker has the opportunity to make

observations on how material cultures worked that other social scientists are not likely to secure, because mostly they are not accustomed to field observations. Not even anthropologists give attention to the husbandry of their primitive peoples in the sense that should be expected from a geographer observing the same people. It is difficult to imagine a human geography that fails in expertness in the processes of getting a livelihood. If pack trails are geographic phenomena, the pack trains that use them are also; the feeding places that the animals use involve a knowledge of the fodder or forage on which they depend; then why not also the utility of the animal as to distance it can cover and load it carries, and the whole process of loading and driving? Let protest fall where it may, I should not be interested in historical geography or in human geography except as helping to understand the differentiation of cultures, and I cannot get understanding of this sort except by learning the ways and devices men have used for making a living out of their homelands.

Fossil forms may be considered those that are no longer functioning, but which still exist, either obsolete or as ruins. The field study of ruins is important, for it alone will show in some cases localization of production or settlement that has failed. There are the direct ruins of habitation that give clues as to why people once lived there, from hearth places of early man to abandoned farmsteads. There are the curious and persistent alterations of soil where once an earthen floor stood, or the refuse of settlement was dumped, often expressed by characteristically different vegetation. There are the escaped plants of the household that may propagate themselves indefinitely in its vicinity, the lilac bushes of the northeast, the Cherokee rose of the southeast, pomegranate and quince in Spanish American lands. There are ruins of land use in abandoned fields that may be identified from prehistoric surfaces of tillage to the boom agriculture of two decades ago. The evidence may be in particular plant succession, in changes in the soil, even in ancient furrows. In the Old South, it is well known that the exact limits of old fields may be determined by stands of old field pine, and the time of abandonment approximated by the age of the trees.

There are lesser lines of historical field work, the place names that have connotations of olden days, folk customs and dialectic turns that reveal traditions of times when tradition was a living part of the economy, the memories that still belong to the oldest members of the group. The oddments one thus turns up by living with a people are not inconsiderable, and occasionally there is a lead that is most revealing. I may refer to the illumination that Eduard Hahn got out of considering unconsidered trifles about food and drink habits in Europe, especially vestigial mannerisms that no one had considered before him.

In all historical geography, field work demands most acute observation, constant alertness to clues, flexibility in hypothesis. It is not comfortably routinized as may be the mapping of current land utilization.

There is urgency in such field observations. Year by year the sweeping hands of modern industry and commerce brush away more and more of what is old. Traditions die with the old people; documents are destroyed; weather, storm, and flood erase the physical remnants; science and market standardization destroy old crops. Now is a better time than will ever be again for both student and the records, before the years invalidate both.

Thus a science of comparative regional geography may grow up among us, which will shun the following fallacies: 1) That geography has substance as a science of contemporaneous activity, 2) that historical geography can be done by adding the missing environmental notations to the works of historians, 3) that historical geography is only library work, 4) that a geographer can acquire expertness by knowing a little about a lot of unrelated localities, 5) that descriptive studies, done without regard to process, *i.e.*, genesis and function, can add up to a science, either physical or social, 6) that geography can deal with relations of culture and site without understanding the nature of cultural process, growth, and differentiation, and 7) that there is some way of compensating lack of curiosity and dearth of knowledge by devices of style and organization.

SOME THEMES IN HISTORICAL GEOGRAPHY

A number of general problems are suggested as the sort of comparative knowledge we should be advancing:

1) Certain processes of physical geography, involving secular change, may effect man. a) The most important is the problem of climatic changes or cycles. The other sciences of man expect us to get the answers as to facts, nature, and direction of climatic alteration in human time. The areally specialized geographer has the opportunity to shed light on the controversial subject. In all the dry margins of the world, this topic is of major concern; especially, have their boundaries expanded since the beginning of agriculture? Methods and results in using non-instrumental climatologic data might well constitute a recurrent symposium at meetings of this association. b) In part connected with this question is the problem of natural changes in vegetation since glaciation; few problems should be more interesting to the geographers of the interior United States than that of the prairies, or of the humid grasslands in general. c) Another topic is that of natural changes of coast line and drainage in the period of human occupation. In these meetings, Russell has pointed out drainage changes of the Mississippi, some since the crossing of De Soto. Marsh's classic *Man and Nature* outlines a lot of such problems.

2) Man as an agent of physical geography. a) At present, we incline to deny all effects of settlement and clearing on climate, in contrast to the attitude of an older generation, as shown by the literature of early American forestry. Indeed the science of forestry began largely on the hypothesis that trees diminished climatic extremes. We are hardly sufficiently well informed to dismiss this topic entirely. There is, in terms of our present information, no assurance that in certain climatic tension zones, as of dryness, radical alteration of the ground cover cannot affect critical relations of temperature, humidity, and moisture availability at and near the ground level. I should not be entirely sure that man has not extended the limits of deserts by altering the climatic condition of the lowest film of the atmosphere, which may be called the intra-vegetational climate.

b) Geographers have given strangely little attention to man as a geomorphologic agent. Soil erosion is the popular name for the processes of surface removal that man has released or accelerated. The incidence of soil erosion may be a major force in historical geography. Did soil losses sap the Mediterranean civilizations? Were the Virginians great colonizers because they were notable soil wasters? Geographical field work should embrace thorough search for full, original soil profiles and note the characteristic diminution or truncation of soil profiles in fields and pastures. Thus only can an understanding of the age, nature, and extent of wastage of productive surfaces be secured, and thereby the changing fortunes of human agricultural regions registered. The strange blind spot of geography to this, one of its most basic problems, may illustrate the result of dodging historical approach.

The aggradation of waste on surfaces below the slopes of cultural denudation is, of course, the complementary part of the situation. Gullies mostly are advanced, acute symptoms of soil erosion, including some that have served in text-books as illustrations of normal youthful valleys. How often have geographers distinguished between natural ravines and man-induced gullies, or found the latter of interest as to their incidence and life history? Surely nothing could be more geographic than critical studies of the wastage of surface and soil as expressions of abusive land occupation. On the one hand, are the pathologic physical processes; on the other, the cultural causes are to be studied. Next come the effects of continued wastage on survival of population and economy, with increasing tendency to degenerative alteration or replacement. Finally, there is the question of recovery or rehabilitation.

The theme was clearly indicated as a formal problem of geography three-quarters of a century ago by Marsh. Geographers have long given lecture courses on Conservation of Natural Resources and considered the evils of

soil erosion. But what have they done as investigators in the field, which may lie actually at the doorsteps of their class rooms? Is the answer that soil students should study sheet wastage, geomorphologists gullies, agricultural economists failing agriculture, rural sociologists failing populations, and the geographer prepare lectures on what others investigate?

c) All results of destructive exploitation must be regarded as involving changes in habitat. The presence of civilized man has often meant changes in the regimen of streams and of underground charge of water. Irrigated areas show here and there the creeping paralysis of alkali accumulation, or of water logging. The forms of dissipation of natural capital are many, their causes are cultural, their results are slow crises in the affected areas, their connotation is therefore a matter of human geography.

d) A special problem of the alteration of the land by man is the relation of culture to plant and animal ecology. There are questions in this field that may be reserved to the plant or animal specialist. The historical geographer, however, must take this topic into account in so far as he is able to deal with it and, since he works deliberately with historical data, he may encounter evidence that the ecologist will not. In Mexico, for instance, it is apparent that civilized and primitive men have modified the vegetation rather differently. Primitive husbandry was far less bound to low slopes than is modern agriculture. Given certain conditions of climate and soil, hoe agriculture was in effect a long-term forest-crop rotation, usually on hill and mountain slopes. Under such a system, in effect as it has been for thousands of years, the whole of the present wild flora may represent locally a type of old field succession. The coming of the white man introduced in certain areas a new form of pressure on the native vegetation through heavy grazing. About the mines in particular, he effected complete deforestation through the needs of wood and charcoal in the mines, as well as by persistent pasturing of stock about the mining camps. The old mining camps may now be surrounded by open country for many leagues where once there were forests and brushlands.

These are some of the themes which the historical geographer may well develop. In the process he will probably learn somewhat about the suppression of certain vegetation elements because of their superior utility to man, or because of their low ability to reproduce, or because of their sensitivity to an ecologic balance. There is nothing particularly esoteric about learning the important constituents of a native flora, or even in observing their habits of reproduction and growth. One observer may go farther with this theme than another, but its appropriateness can hardly be questioned, and the cultural approach may sharpen observation of the biotic association as to time elements. In climatic tension zones in particular, it is possible that human

interference may operate characteristically to displace widely former vegetation boundaries. Any area with a long grazing history, in particular, should be examined in this respect as to the replacement of palatable browse and grass by unpalatable, probably woody or bitter, succulent elements. The role of fire, especially in the hands of primitive man, needs much additional observation, undertaken with the knowledge that long-continued burning may have opposite effects on vegetation from those that result from a short series of burnings.

3) Sites of Settlement. The location of a settlement records the particular preferences as to habitat that concerned the founders. Since a settlement once established is not readily transferred, subsequent culture changes alter the site value, and confront the people of the town with the alternative of moving or of meeting developing handicaps. Perhaps if we were locating our cities *de novo,* we should place relatively few of them in the exact site which they occupy. Consider the towns that grew up on once navigated streams, on portages, and under other site selections that have lost their significance, but which have imposed repeated problems on later generations as transport, supply, and municipal services have changed. If California were being settled today, San Francisco would probably be a middle class suburb of a major city across the bay. Yet in the 1840's, San Francisco was the most eligible site for a port at which ocean and river transport met. It has successfully maintained a large number of urban functions in which it acquired initial dominance, and has on the whole overcome the handicaps of a transverse peninsular position as these have developed.

At the time a settlement is made, it may generally be regarded as combining in its site the best means of satisfying the wants of the founding group. It is necessary, therefore, to regard the site in terms of the original wants. In one case, protection may be important, in another indifferent. Food and domestic water needs and transport advantages vary with the founding culture. Site classifications in terms of cultural attitudes at the time of origin of settlement have been rarely made, yet here is the basic chapter in a science of urban geography. Next would come site revaluations and accommodations under change of culture—the site viewed under successive stages.

4) Settlement Patterns. We do not have a great deal of comparative historical knowledge about a) dispersal or agglomeration of habitation, or b) about the spacing and size groups of settlement clusters that develop under particular cultures, or c) of the functional specialization as between town and town within one culture area, or d) of functional differentiation within a major town. These are some of the most obvious problems of localization of habit that need inquiry in historical and regional terms.

5) House Types. Americans have given little attention to the unit of

dwelling, which commonly approximates the social unit, or the family in its inclusive connotation, rather than in the marital sense. Is the dwelling unit single or multi-family, does it provide for its dependents and retainers, does it include arrangements for the domestic animals? Does it include formal provisions for the storage of primary necessities or for the exercise of crafts or trades? What is the functional generalization of the house plan? The study of house types basically is the study of the smallest economic unit, as that of village or town is that of an economic community. In both cases description seeks the meaning of structure in relation to institutionalized process, as an expression of the culture area. Houses are historical geographic records. They may date from a former historical stage, or they may, as current buildings, still preserve conventional qualities which once were functionally important (fireplaces, porches, shutters, on American houses).

6) Land occupance studies with regard to the historic structure of the culture area. At any given time, in theory, there is a momentary equilibrium of habitat evaluation and habit wants. Environmental advantage or disadvantage should then always be relative to the moment or stage of the particular culture, and land use an accommodation of the wants and energies of a community, that changes as these change. To change, however, usually involves considerable lag, partly because of the difficulty of revising property lines. The rationalization of land use meets the opposition of the design of fields and other land holdings of earlier days. At any one time land rights and land use are likely to conserve a good deal of the past. Settlement patterns, house types, field systems and land ownership are the best recognized observational items used in reconstructing changes and continuities.

7) What of cultural climaxes? Is there in human societies something like an ecologic climax, a realization of all the possibilities inherent in that group and its site? What of limits of population growth, of production attained, of accumulation of wealth, even of increment of ideas beyond which the matured culture does not go? We may be skeptical of the more extreme hypothesis of the cyclic character of all culture, but we too are concerned with the recurrence of cultural peaks, of stabilization, and of cultural decline. The rise and fall of cultures or civilizations which has interested most historically minded students of man cannot fail to engage the historical geographer. A part of the answer is found in the relation of the capacity of the culture and the quality of the habitat. The case is relatively simple if destructive exploitation can be shown to have become serious. There is also the knotty problem of overpopulation (which may be very much a reality in the culture historical sense though a heresy to the theoretical social scientist), involving diminishing opportunity and sharing for the individual.

There may arise loss of productive energy by mal-distribution of population as between country and town, between primary producers and these who are carried as leisure class. There may be shift of comparative advantage to another people and area. A melancholy and stimulating subject is this scrutiny of the limits of culture.

8) Cultural receptivity. A new crop, craft, or technique is introduced to a culture area. Does it spread, or diffuse vigorously, or does its acceptance meet resistance? What are the conditions that make a certain group eager to accept innovations, whereas another chooses to continue in its old ways? This is a general problem of social science, which in part can be examined by geographic studies.

The geographer, in the first place, is best able to determine the existence of physical barriers or corridors. Perhaps a crop does not spread because it encounters an unsuited climate, perhaps because the soil which it requires is not of a type that a particular husbandry has learned to utilize.

In the second place, the geographer presumably has kept track of the presence or absence of material culture traits. He should know whether a crop or a skill is confronted by a satisfactory alternate already established in the area. The dissemination of wheat growing in Latin America has been considerably affected by the food habits of the people with regard to other starch and proteid crops. It is only true in terms of world markets and hence strictly commercial production, that the yield of a given plot as to wheat or corn will determine which will be grown. I should like to add that even the current world market price is only an expression of cultural demand from a dominant purchasing group, not a real expression of utility of the several grains.

It may well be remembered that Ratzel founded the study of the diffusion of culture traits, presented in the nearly forgotten second volume of his *Anthropogeographie,* and that Eduard Hahn came upon the great problem of his life work by asking himself why some people engaged in dairying and others would have nothing to do with milk or its products.

9) The distribution of energy within a culture area. Here we may refer to the great thesis of Vaughan Cornish, that of the cultural "march." His view is that every growing civilization has had an active frontier—an actual frontier on which the energies of the people become massed, where power, wealth, invention are most highly developed. This has some resemblance to Turner's thesis of the frontier, though it does not involve the necessity of continued expansion. It begins with expansion, but the energies of a culture once localized on such a border may continue to manifest themselves by leadership in many ways long after expansion has ceased. Historically, therefore, it is not in the central parts of a culture area that the great de-

velopments take place, but on what was both the most exposed and the most alluring border. There is a lot to be done in considering the dynamic fields (*Kräftezentren*) within the whole expanse of a given culture area. There is much to be said for the thesis of Cornish. The dynamic front of Mexico, *e.g.*, has been the northern border throughout its history. Archeology, in both New and Old World, shows many illustrations of the flowering of culture at the far margins of a culture complex.

10) Cultural stages and succession. Turner made an unfortunate error when he accepted an ancient, deductive view that human progress advances through an identical series of stages, which he thought he could recognize as general stages of the American frontier. We know that there is no general cultural succession, but that each culture must be traced separately through its history of acquisitions and losses. Hahn's great work, in particular, warns against deductive approaches to cultural stages, as, for example, by his denial that pastoral nomads derived from hunters rather than from older agricultural backgrounds. Since cultural change by no means follows a general or predictable course, it is necessary to trace back each culture through its historical steps.

It is not generally appreciated that the first and dominant pattern of Spanish settlement of the New World was the formal organization of all Spaniards into town corporations and their permanent domiciling in such a *villa* or *real*. From this basic knowledge that the Spanish pioneer was a member of a town corporation at all times, the nature of Spanish penetration and economic organization acquires a very different form from that of the settlements by the other colonial powers of the New World. On our American frontier, there was no such uniformity as in Spanish America, but a considerable number of first stages from North to South, dependent on colonizing group, nor was there one type of frontier in the Westward movement. Might it not be time for geographers to try to characterize the culture complexes and successions in the settlement of the United States? It should provide substance for some of the future meetings of our Association.

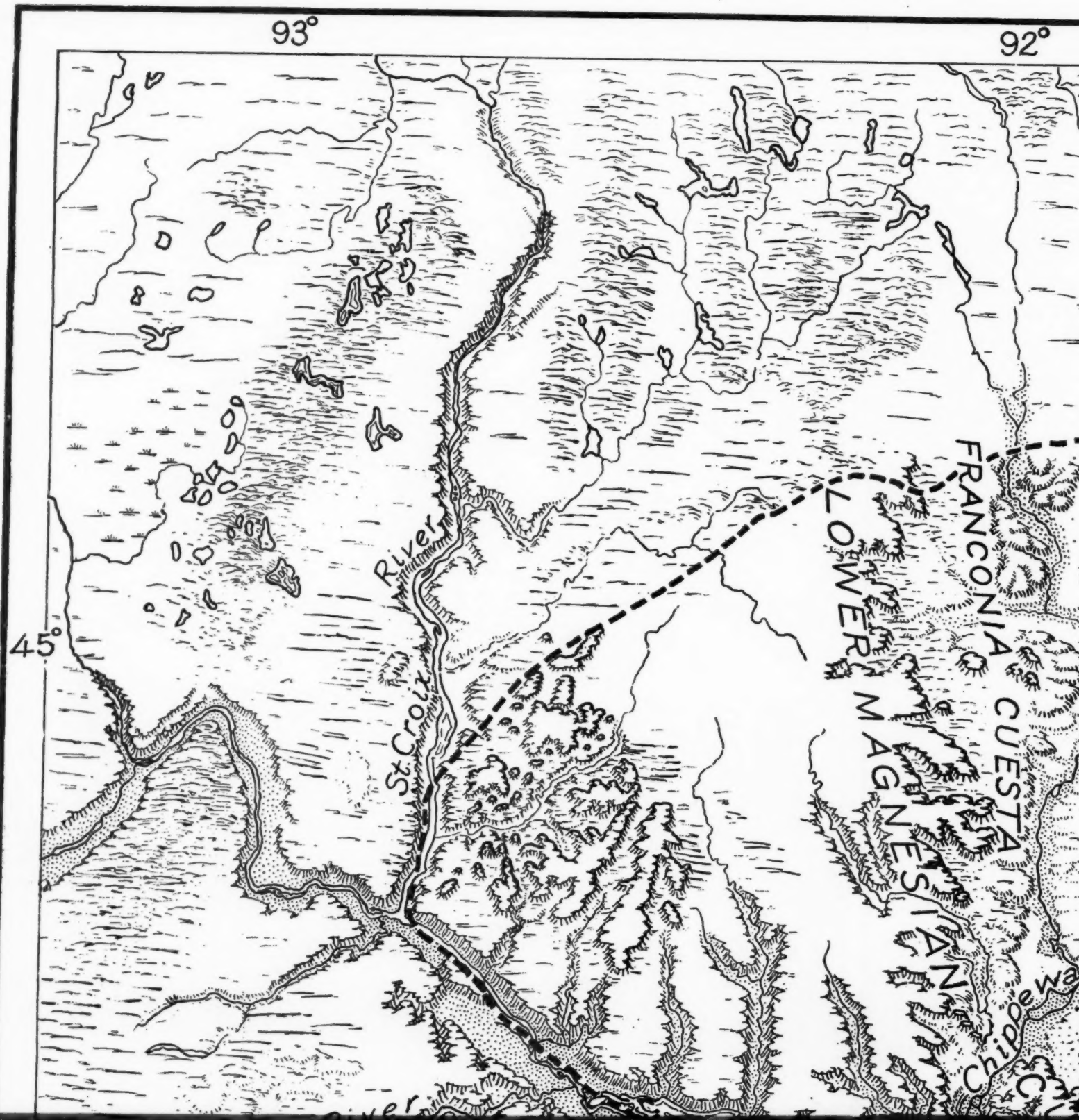
11) The contest for area between cultures. Certain cultures have been notably aggressive; some such can be determined for almost any part of the human past. The contest for dominance in the meeting zones of cultures, the manner in which a balance is established and a boundary takes form, express cultural energy and adaptability. Ratzel had in mind this sort of study in his political geography, which stressed the historical struggle for space. Whether by conquest, absorption, trade, or superior adaptability, all cultures have been marked by ground-gaining or ground-losing qualities.

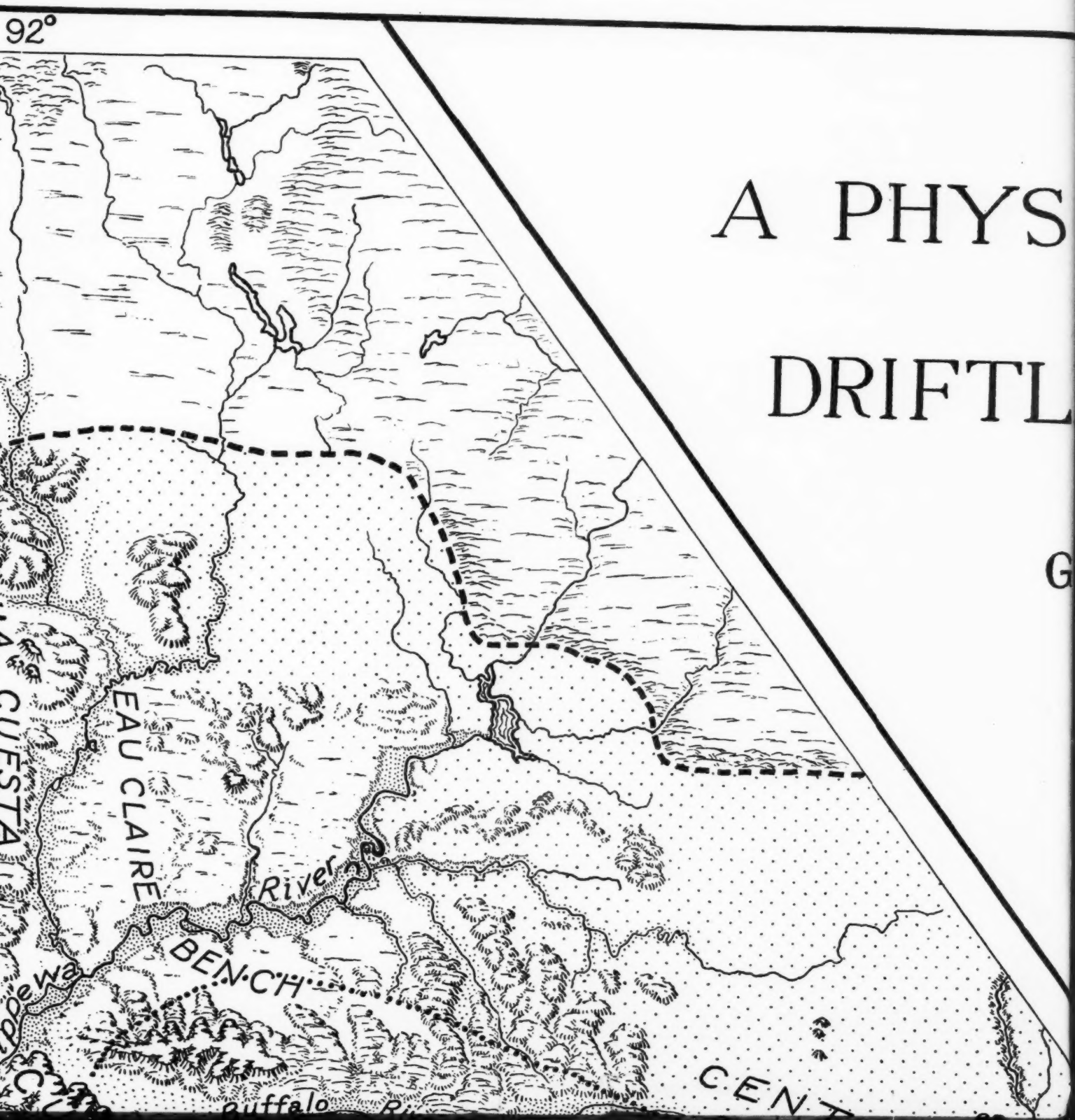
CONCLUSION

The human geographer has the obligation to make cultural processes the base of his thinking and observation. His curiosity is directed to the circumstances under which groups or cultures have diverged from, or been assimilated to, others. Most of the history of man has been a matter of differentiation of culture and of reconvergences. We cannot even point to a uniform human culture back in the dawn of Paleolithic time. The Tower of Babel is almost as old as man. In the literal meaning there are very few "common-sense" qualities about living habits, that is, things that are most sensibly done in one way only, general logical or psychological necessities. I fear that the more theoretical social sciences—like economics—are likely to lose sight of this truth. In this country, we are likely to forget this because we happen to be part of a tremendously vigorous and widespread culture, so confident of itself that it is inclined to regard other ways as ignorance or stupidity. The terrific impact of the modern western world, however, does not repeal the old truth that the history of man has been markedly pluralistic, and that there are no general laws of society, but only cultural assents. We deal not with Culture, but with cultures, except in so far as we delude ourselves into thinking the world made over in our own image. In this great inquiry into cultural experiences, behaviors, and drives, the geographer should have a significant role. He alone has been seriously interested in what has been called the filling of the spaces of the earth with the works of man, or the cultural landscape. His primarily is the difficult job of discovering the meaning of terrestrial distributions. The anthropologists and he are the principal social scientists who have developed field observation as a skill.

The themes suggested for our work may represent a task beyond our immediate individual or joint ability, but they are at least a design of the quality of knowledge we seek. Our several efforts may build consciously toward the understanding of the differentiation of the earth at the hands of man. We shall not get far if we limit ourselves in any way as to human time in our studies. Either we must admit the whole span of man's existence or abandon the expectation of major results from human geography. Either we must produce, or warm over what others have prepared. I see no alternative. From all the earth in all the time of human existence, we build a retrospective science, that out of this experience acquires an ability to look ahead.

University of California.
January, 1941.


93°
92°
45°
St. Croix River
FRANCONIA CUESTA
LOWER MAGNESIAN
Chippewa


92°
A PHYS
DRIFTL
G
EAU CLAIRE
River
BEN·CH
CUESTA
CENT
Buffalo

PHYSIOGRAPHIC DIAGRAM
OF THE
DRIFTLESS HILL LANDS
BY
GUY-HAROLD SMITH

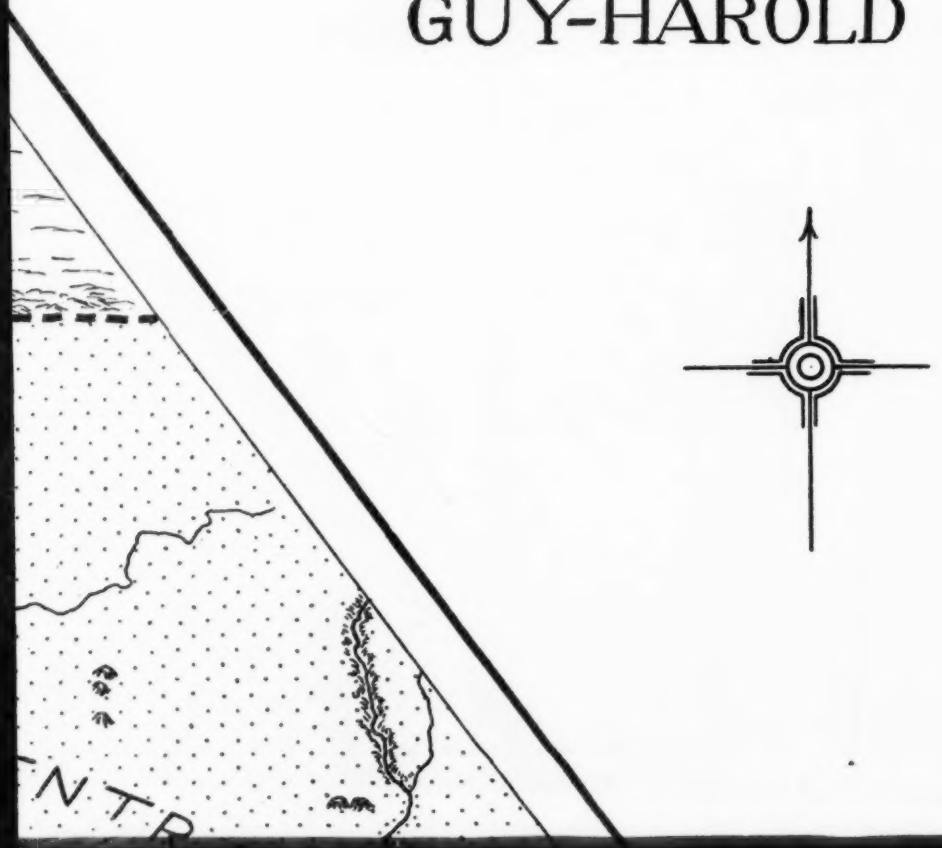


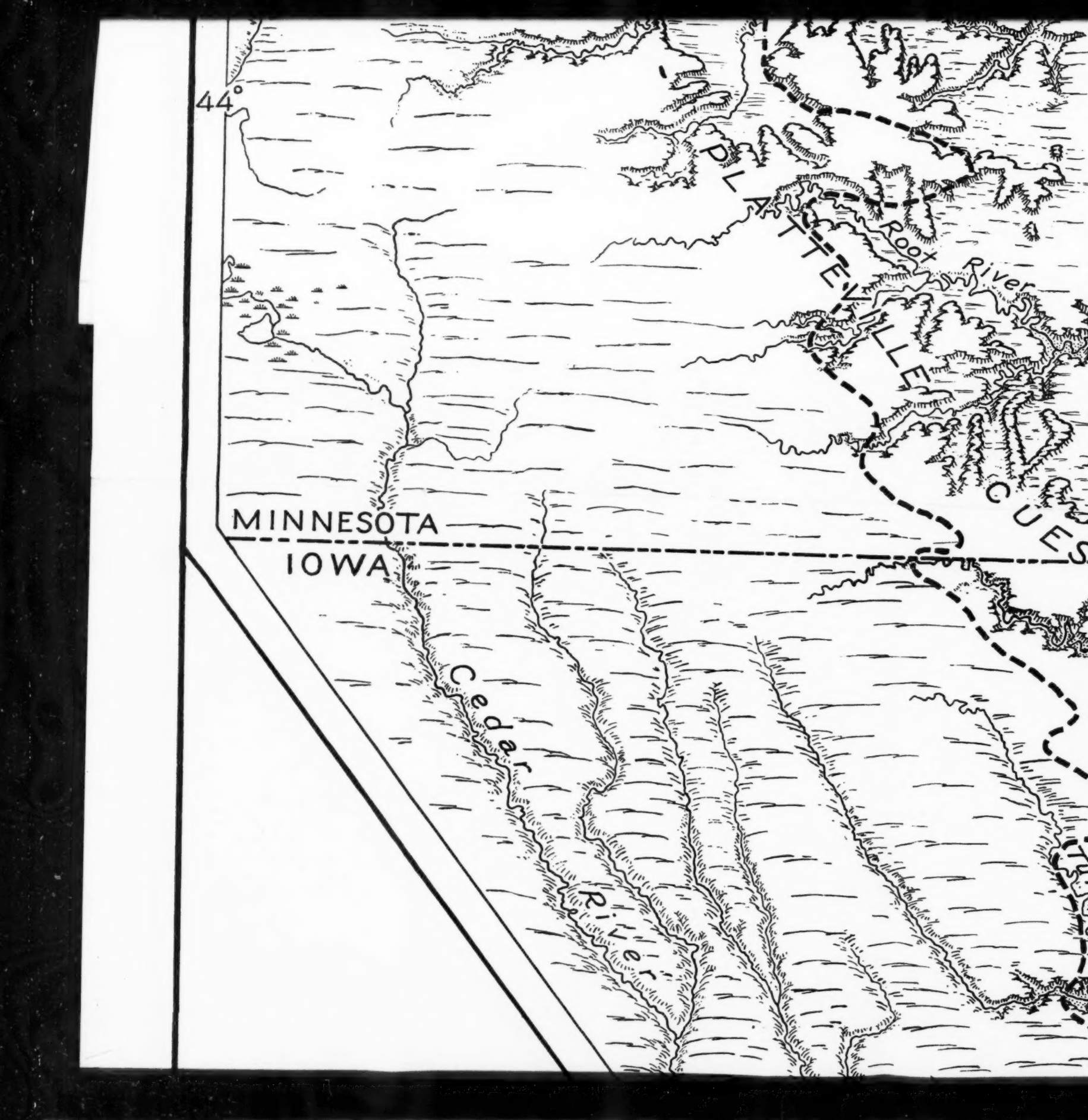
FIG. 1

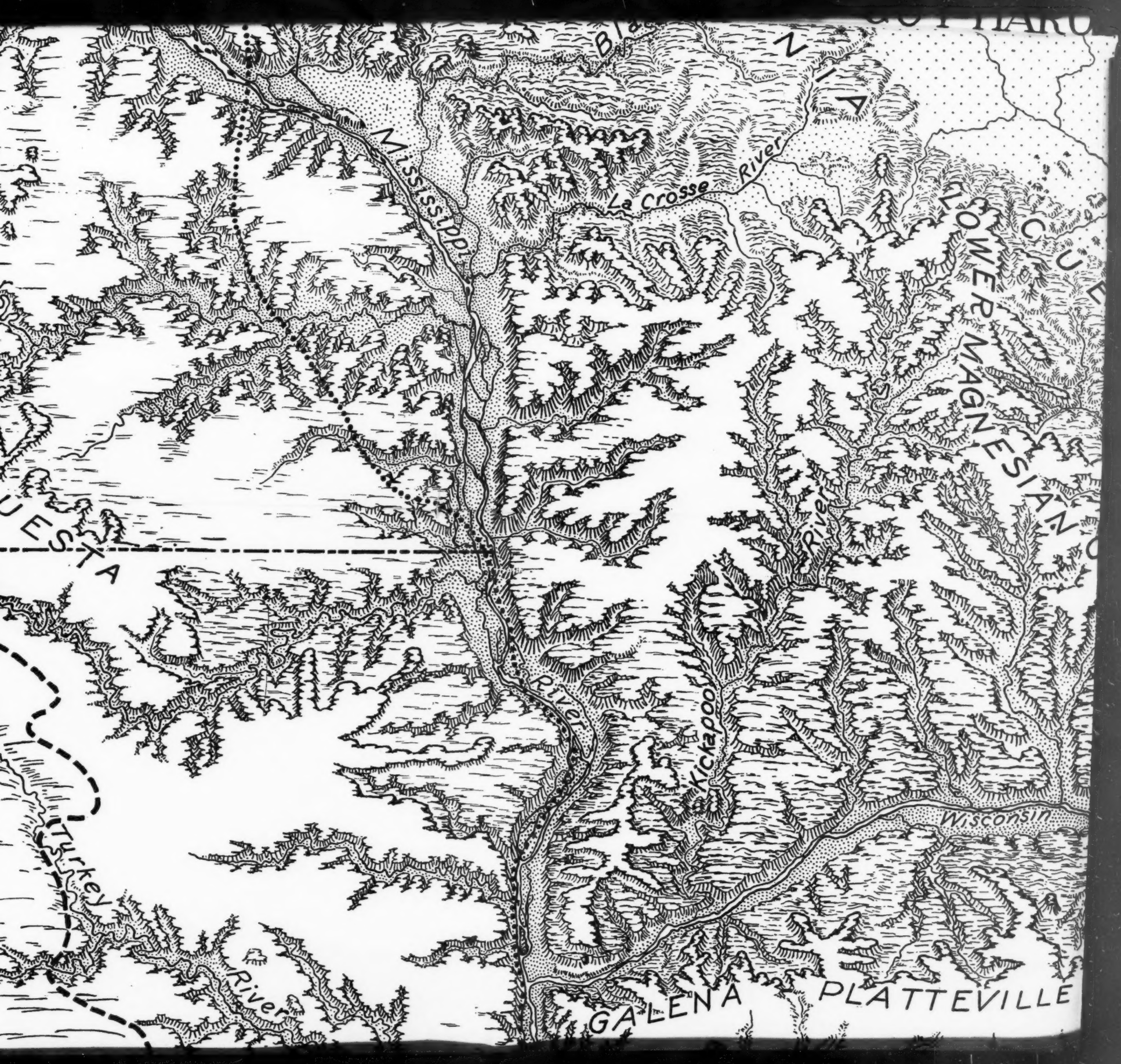
M

45°
44°
St. Croix
River
Cannon
River
Lake
Pepin
Zumbro
River
GALENA
CUESTA
MAGNESIAN
Chippewa

EAU CLAIRE
River
BENCH
CUESTA
Buffalo River
CENTRAL
River
Trempealeau River
FRANCONIA
Black
River
La Crosse River

FIG. 1


44°
PLATTEVILLE
Root River
MINNESOTA
IOWA
Cedar River


Mississippi
La Crosse River
Wisconsin
Kickapoo
River
Turkey
River
GALENA
PLATTEVILLE

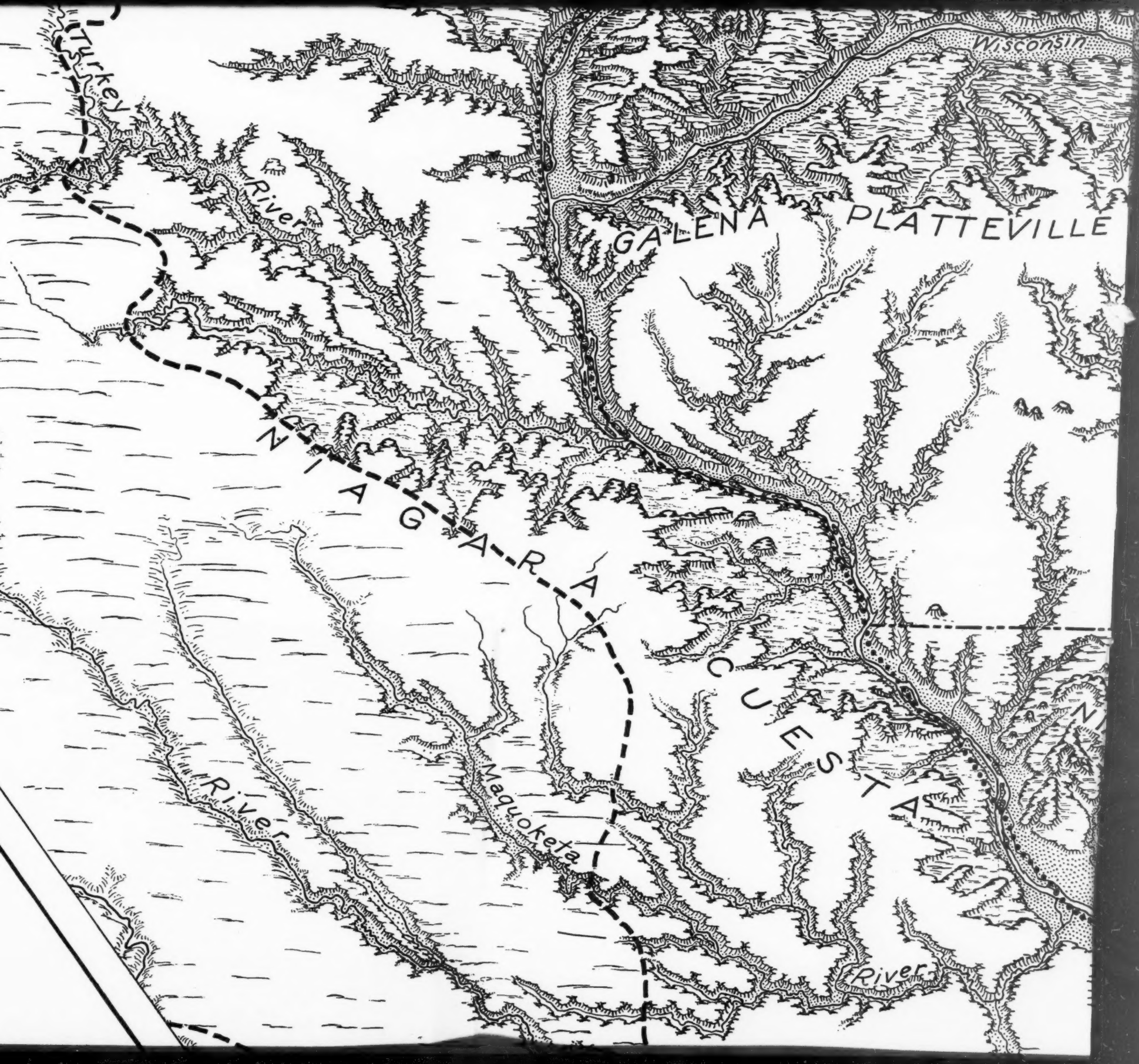
Blas
N I A
Mississippi
La Crosse River
LOWER MAGNESIAN CUESTA
CUESTA
Baraboo
Bara
Kickapoo
Wisconsin
PLATTEVILLE CUESTA
GALENA

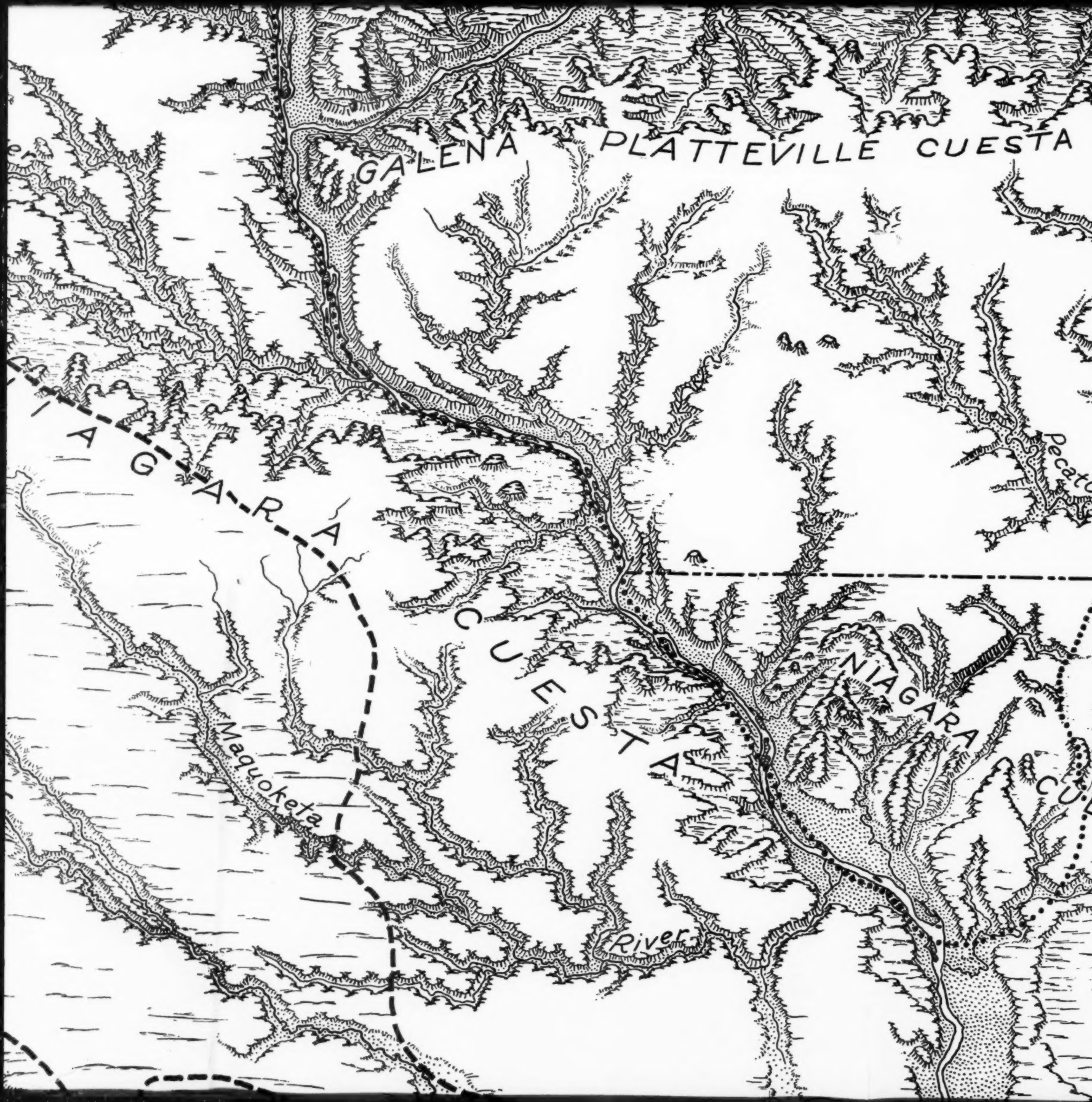
River
Range
Baraboo
River
Lake
Mendota
Blue Mounds
43°

LEGEND

MARGIN OF THE WISCONSIN DRIFT SHEET ----------

MARGIN OF THE EARLIER DRIFT SHEET ....


Turkey
River
Wisconsin
GALENA
PLATTEVILLE
NIAGARA
CUESTA
Maquoketa
River
River


GALENA
PLATTEVILLE CUESTA
NIAGARA
CUESTA
Maquoketa
River

Lake Mendota
TA
Blue Mounds
43°
Pecatonica
WISCONSIN
ILLINOIS
River
CUESTA
42°

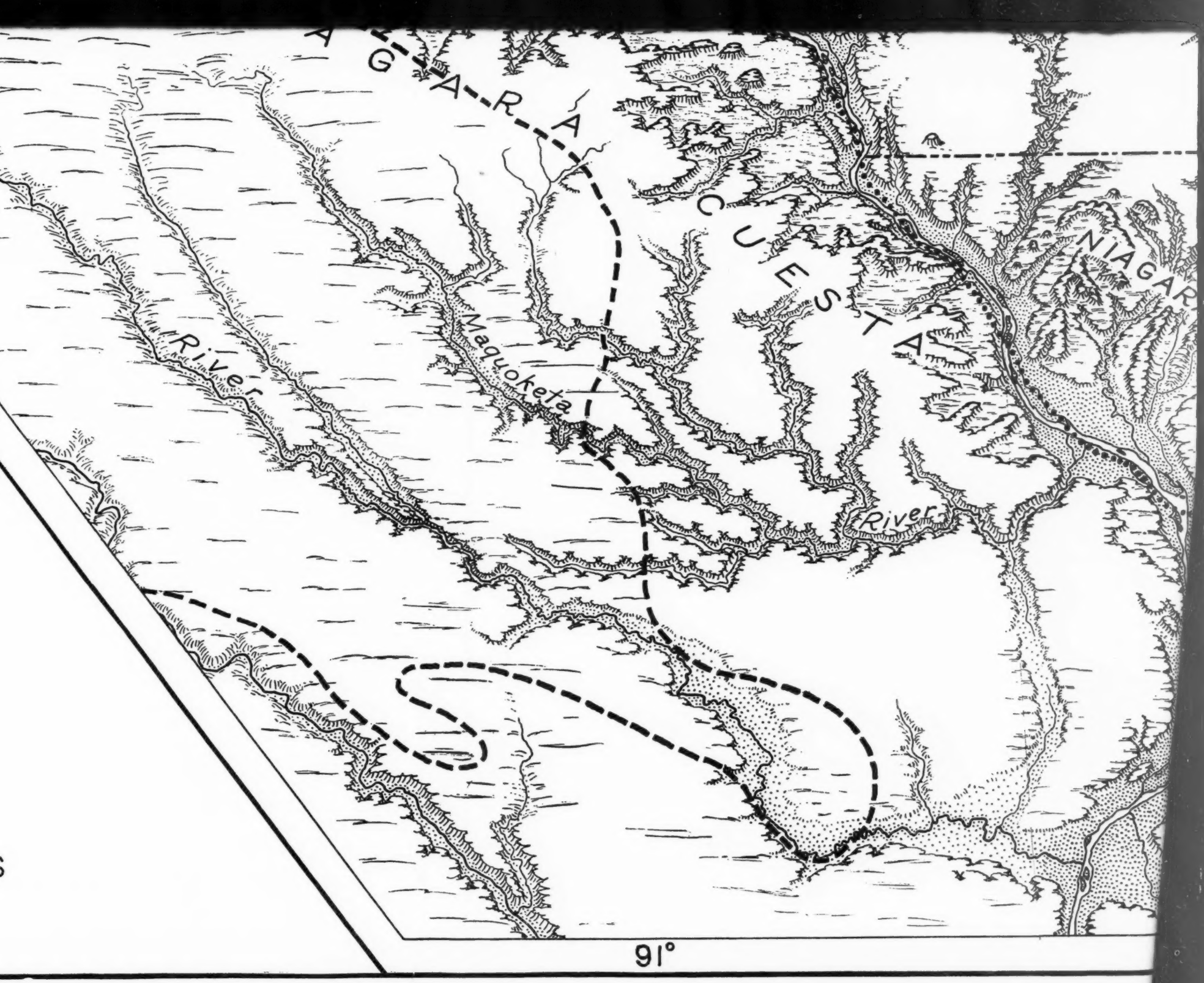
LEGEND

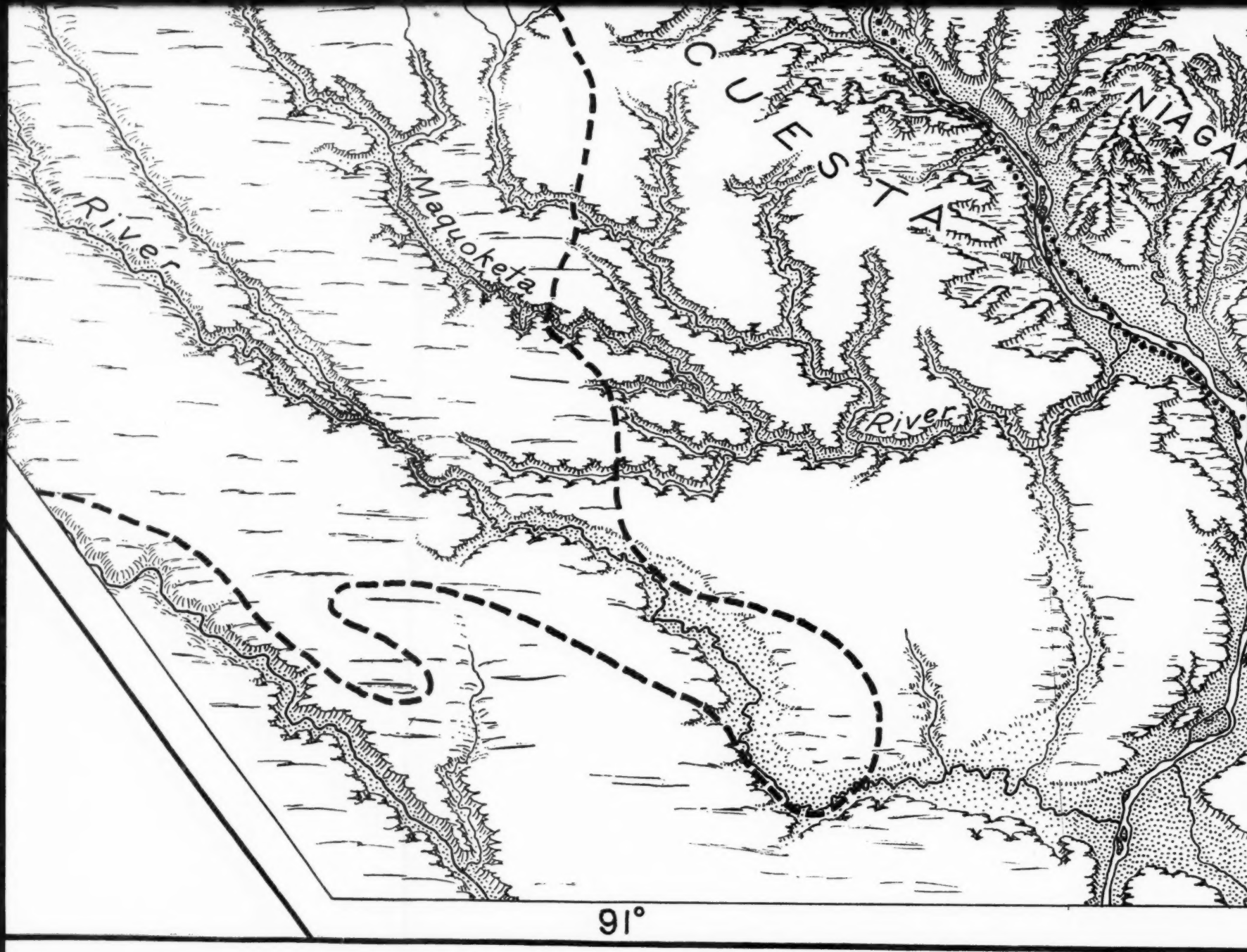
MARGIN OF THE WISCONSIN DRIFT SHEET

MARGIN OF THE EARLIER DRIFT SHEET

SCALE

0 10 20 30 40 50 MILES


A
G
A
R
A
CUESTA
NIAGAR
Maquoketa
River
River
91°


CUESTA
NIAGA
Maquoketa
River
River
91°

ILLINOIS
River
AGARA
CUESTA
42°
Rock River
90°

Surface Configuration of the Driftless Cuestaform Hill Land*

GLENN T. TREWARTHA AND GUY-HAROLD SMITH

The present paper has a two-fold purpose. Primarily it is to present one phase of the geography of a region that the first-named author is making the object of a long-time investigation.[1] Secondarily it is to illustrate, by means of a series of maps dealing with such items as slope, local relief, lithic character, and panorama of forms, a geographic analysis of regional surface configuration. It has been written with the general geographic audience in mind, and does not purport to be of a technically geomorphic character. Geographers have been accused of inadequately treating through illustrations the element of landforms in regional studies. It appeared worthwhile, therefore, to see what kinds of maps could be produced of the region in question, each of which would make some distinctive contribution to an understanding of its surface features.

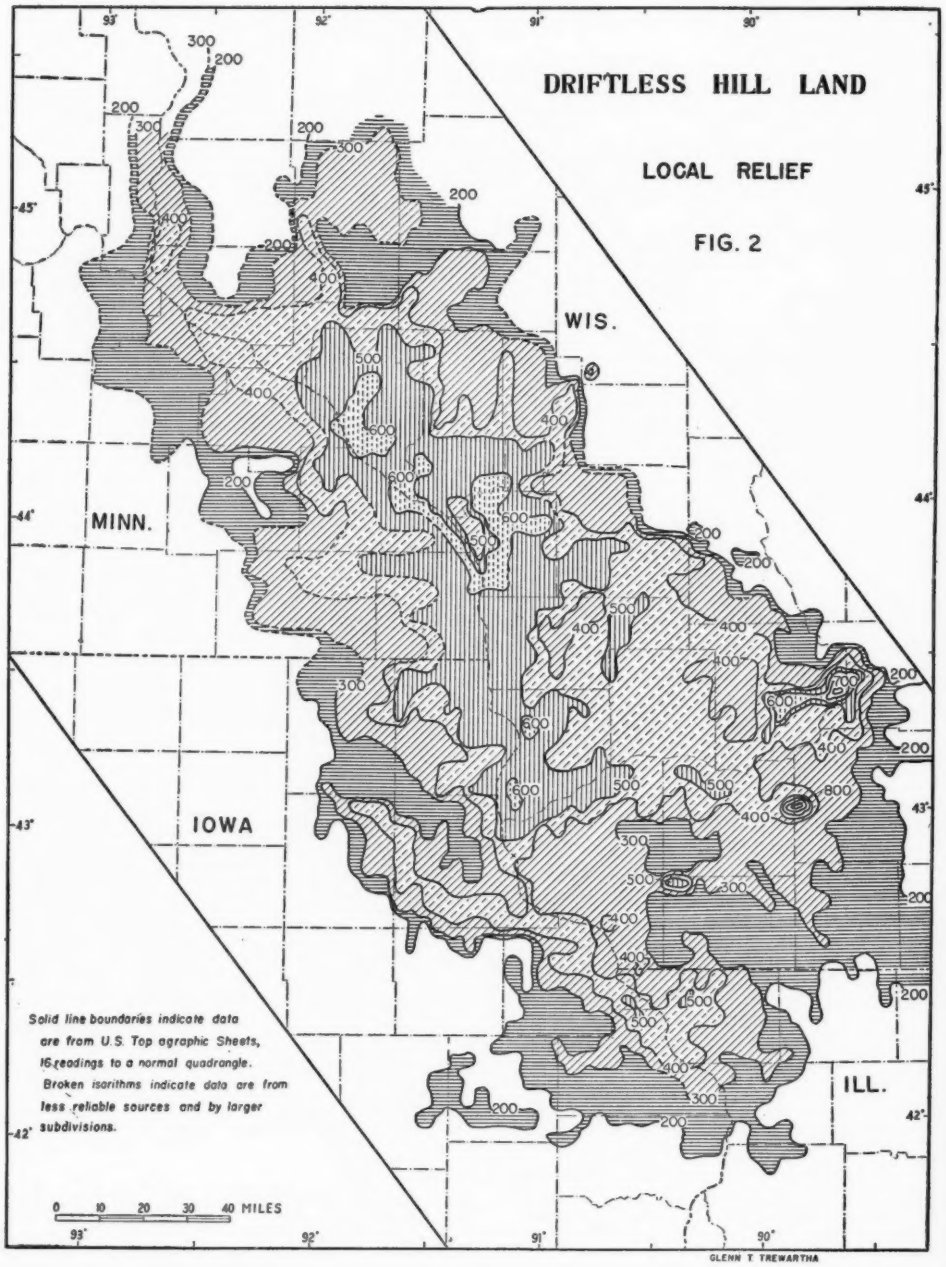
DEFINITION, BOUNDARIES AND MAPS

The Driftless Cuestaform Hill Land along the Upper Mississippi is a submaturely dissected upland whose summit levels vary in elevation from about 900 to 1400 feet. The region is best described as low hill country or rough plain (Figs. 1, 2 and 3). Its circumference is reasonably well defined by a belt, variable in width, enclosed between the local-relief isarithms of 200 and 300 feet. Smaller sections of the boundary are defined by the edge of Wisconsin drift (Fig. 4. See approximate boundary on insert map, Fig. 3). Of the region's total area, roughly 10 per cent exceeds 500+ feet in local relief. At a maximum relief reaches 800 feet (Fig. 2).

Although more rugged than the regions that surround it, it is not distinctly more elevated. Indeed it is part of the inner basin of a great river and is overlooked by higher land at least on its northern and western borders. This fact of elevation is all the more unusual when it is noted that the

* Aid in completing this study has been received from research assistants subsidized by the University of Wisconsin.

[1] The second-named author has been especially interested in cartographical techniques in geographical research. In this paper cartographical methodology finds important application in regional analysis.


DRIFTLESS HILL LAND
LOCAL RELIEF
FIG. 2
WIS.
MINN.
IOWA
ILL.
Solid line boundaries indicate data are from U.S. Topographic Sheets, 16 readings to a normal quadrangle. Broken isarithms indicate data are from less reliable sources and by larger subdivisions.
0 10 20 30 40 MILES
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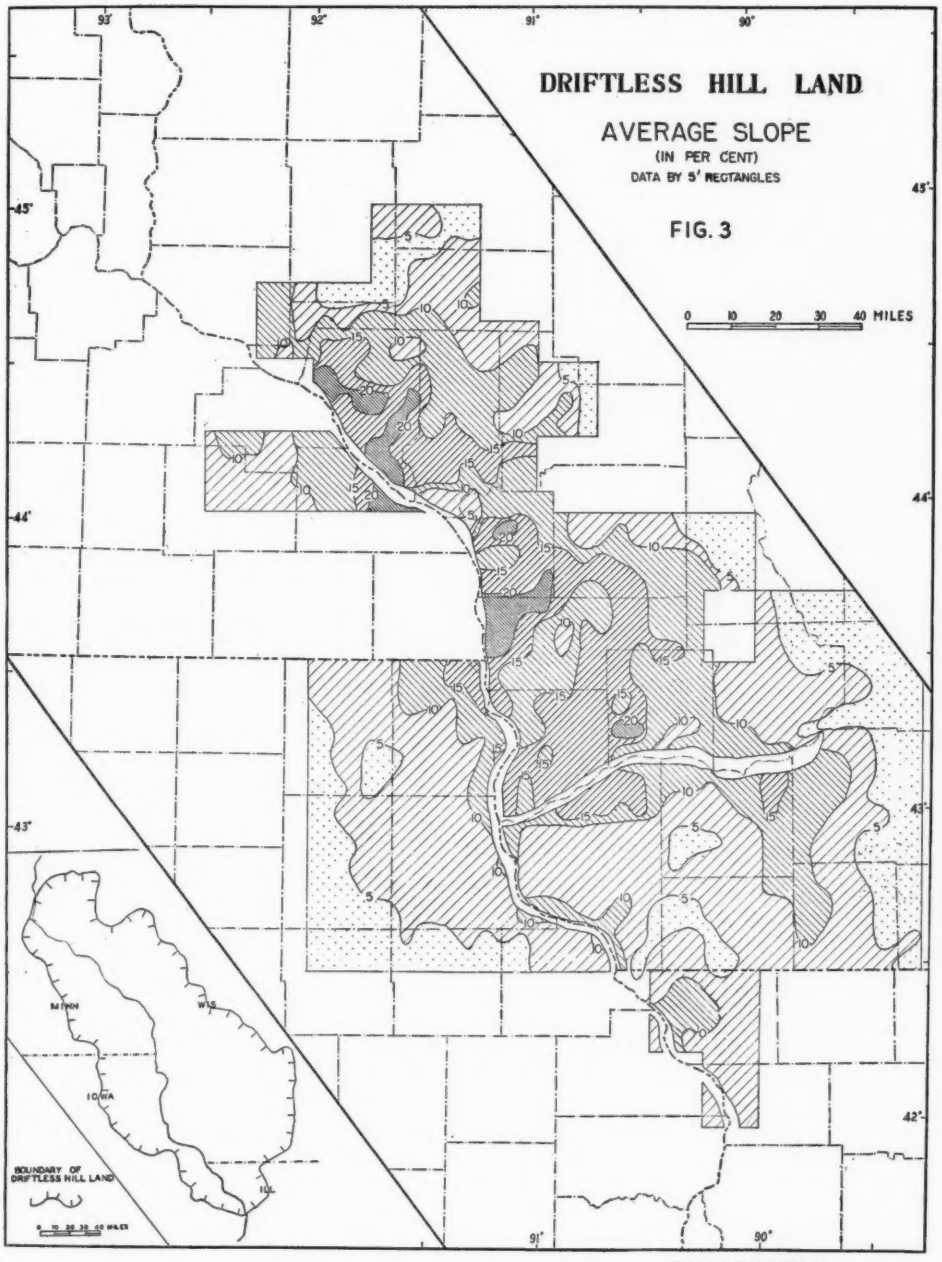

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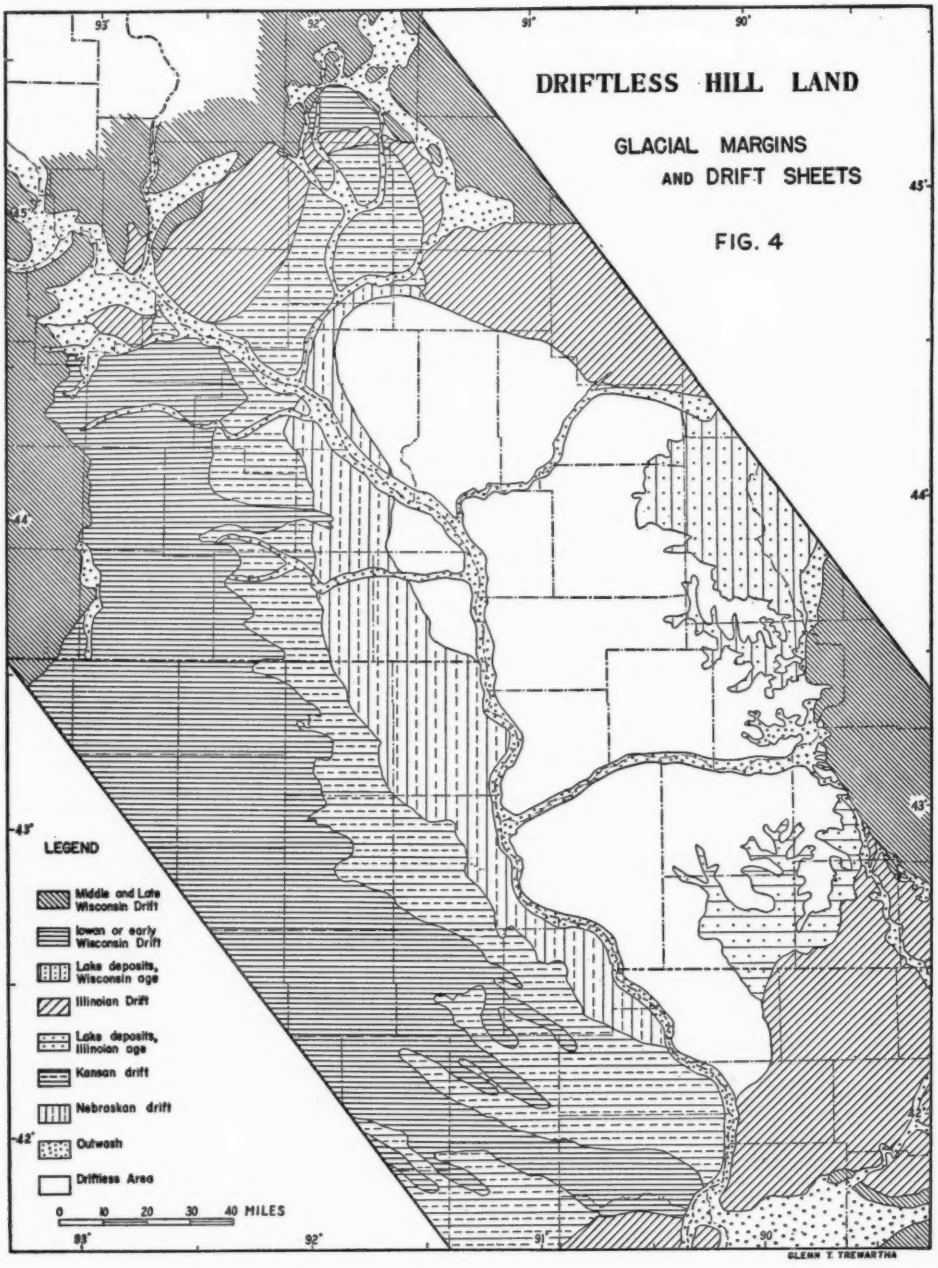
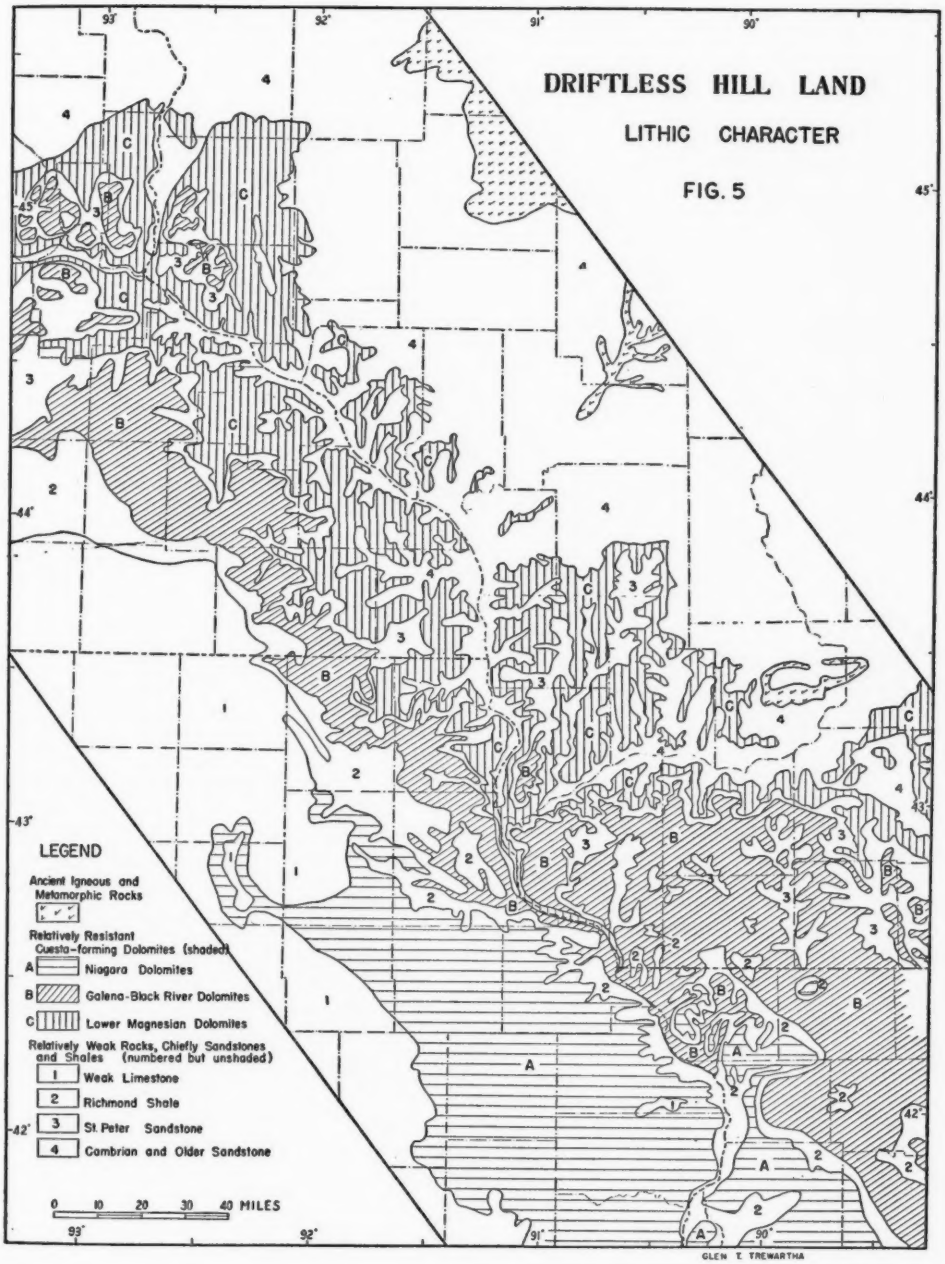
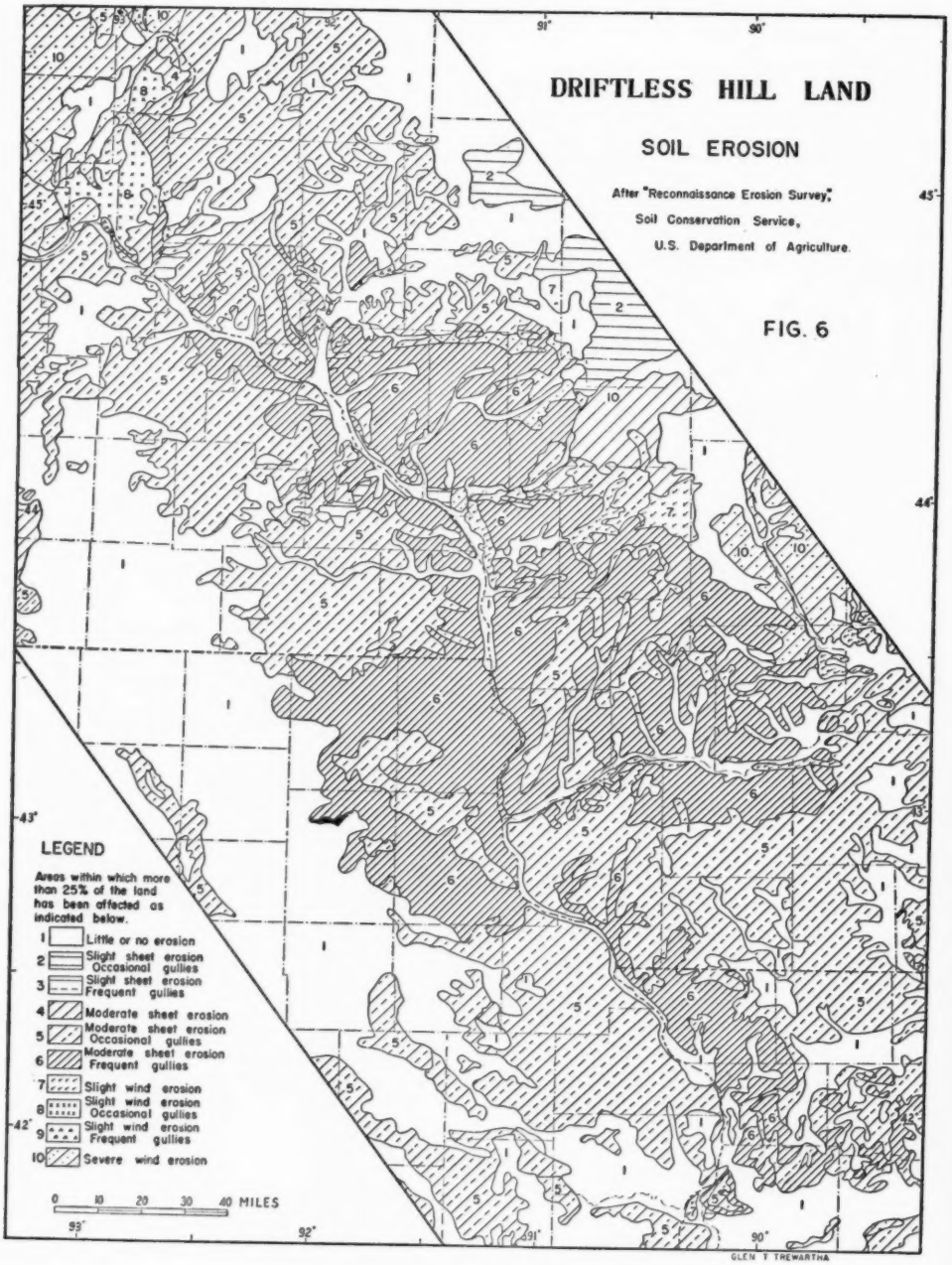

DRIFTLESS HILL LAND
GLACIAL MARGINS
AND DRIFT SHEETS
FIG. 4
93°
92°
91°
90°
45°
44°
43°
42°
LEGEND
Middle and Late Wisconsin Drift
Iowan or early Wisconsin Drift
Lake deposits, Wisconsin age
Illinoian Drift
Lake deposits, Illinoian age
Kansan drift
Nebraskan drift
Outwash
Driftless Area
0 10 20 30 40 MILES
GLENN T. TREWARTHA


DRIFTLESS HILL LAND
LITHIC CHARACTER
FIG. 5
LEGEND
Ancient Igneous and Metamorphic Rocks
Relatively Resistant Cuesta-forming Dolomites (shaded)
A Niagara Dolomites
B Galena-Black River Dolomites
C Lower Magnesian Dolomites
Relatively Weak Rocks, Chiefly Sandstones and Shales (numbered but unshaded)
1 Weak Limestone
2 Richmond Shale
3 St. Peter Sandstone
4 Cambrian and Older Sandstone
0 10 20 30 40 MILES
93° 92° 91° 90°
45° 44° 43° 42°
GLEN T. TREWARTHA


DRIFTLESS HILL LAND
SOIL EROSION
After "Reconnaissance Erosion Survey,"
Soil Conservation Service,
U.S. Department of Agriculture.
FIG. 6
LEGEND
Areas within which more than 25% of the land has been affected as indicated below.
1 Little or no erosion
2 Slight sheet erosion Occasional gullies
3 Slight sheet erosion Frequent gullies
4 Moderate sheet erosion
5 Moderate sheet erosion Occasional gullies
6 Moderate sheet erosion Frequent gullies
7 Slight wind erosion
8 Slight wind erosion Occasional gullies
9 Slight wind erosion Frequent gullies
10 Severe wind erosion
0 10 20 30 40 MILES
93°
92°
91°
90°
45°
44°
43°
42°
GLEN T. TREWARTHA

region under consideration is partly co-extensive with the Driftless Area, whose world fame stems from the fact that nowhere else on the earth is there a similar large area at low elevation, which although surrounded on all sides by glaciated territory, itself was never overridden by ice (Fig. 4). It is evident that this escape from glaciation was not due to elevation.

But since the region being considered is defined principally in terms of (1) degree of local relief, (2) of a kind produced by river erosion, and not by reason of the complete absence of till, a high degree of coincidence with the Driftless Area is not required or expected. On its southern, western, and northern margins the Cuestaform Hill Land extends well beyond the completely unglaciated area into territory covered by ancient pre-Wisconsin ice sheets (Fig. 4). In these sections drift is usually very inconspicuous so that the term "driftless" as applied to the whole region is not a serious misnomer. No part of it, however, lies within the late Wisconsin till sheet. In fact, it is the outer margin of that drift which sets the boundaries of the region along parts of its northern, western, and eastern margins. But while it is true that remnants of ancient till sheets mantle extensive areas of the Cuestaform Hill Land, the point to be emphasized is, that its distinctive features of surface configuration are those associated with normal stream erosion and not with the gradational work of ice.

The map of local relief (Fig. 2) was developed after the method described by Guy-Harold Smith in his paper, "The Relative Relief of Ohio."[2] Each topographic sheet, scale 1/62500, was divided into sixteen equal rectangles, each rectangle being three and three-quarters minutes of longitude and latitude. For each rectangle the difference in elevation between the highest and lowest points was noted and recorded on a base map. Places of equal relief were connected by lines so that an isarithmic map was the result. Some experimentation was carried on relative to the size of rectangle best suited to the particular region. It was found that when either too small or too large rectangles were employed, the resulting isarithmic map failed to reveal the striking features of surface relief. In other words, the size of rectangle for which relief readings are made appears to need adjustment for the degree of coarseness or fineness of the relief pattern. For parts of the Driftless Hill Land United States topographic sheets are not available and for those sections less accurate and less refined data were used. In Minnesota, where topographic sheets are especially scarce, the principal sources for relief data were the county geological maps with 50-foot contours contained in *The Geology of Minnesota,* two vols. (The Geol. and Natural Hist. Survey of Minn., St. Paul, Minn., 1884 and 1888). In northwestern Wisconsin the unpublished field notes and maps of State Geological

[2] *Geog. Rev.*, vol. 25, 1935, pp. 272–284.

Survey workers were the most valuable source. For parts of northwestern Illinois brown-line prints of certain old hand-drawn county reconnaissance contour maps furnished by the Illinois State Geological Survey were employed.

Figure 2 clearly reveals the relief unity of the Driftless Hill Land. It is almost an island of conspicuous relief differentiated from surrounding territory chiefly by its roughness. The belt between the 200-foot and the 300-foot isarithms, which is roughly the boundary of the Driftless Hill Land, has been given a heavy shading so that it stands out rather distinctly. As indicated by the width of this belt the relief gradient between Driftless Hill Land and peripheral regions is relatively steep in some parts and weak in others. The transition is particularly abrupt where the Franconia Escarpment of the Hill Land abuts on the Central Sand Plain of Wisconsin, a part of which is the lacustrine plain of a marginal glacial lake (Figs. 1 and 4). A similar abruptness is to be observed in southern Minnesota and a part of Iowa where dolomite escarpments closely coincide with the margins of Wisconsin Drift.

In general, relief increases from the margins to the center of the region, reaching a general maximum in those parts relatively close to the Mississippi. The only spots of higher relief are coincident with Blue Mounds and the Baraboo Bluffs. Only one extensive area with less than 200 feet of relief has been included, namely, the Lower Magnesian Upland northwest of the Chippewa river in the extreme northern part of the Driftless Hill Land (Figs. 1 and 5). Although not typical in its relief character of the larger area within which it is included, it has more physical resemblances to the Driftless Hill Land than to any adjacent regions.

The map of Average Slope (Fig. 3) is complementary to the Physiographic Diagram (Fig. 1) and the map of Local Relief (Fig. 2). Figure 2 shows only the amount of relief. Figure 3 on the other hand shows how this amount was gained; whether by steep slopes largely unfit for cultivation, or by milder ones susceptible to agricultural use. Such a map is likewise of utmost importance in judging actual or potential soil erosion. Thus Figure 6, Soil Erosion, indicates that the Driftless Hill Land is almost an island of moderate to serious soil erosion by running water, in the midst of regions where erosion is not a serious problem. Since reliable topographic maps are necessary in the determination of the degree of slope, the lack of complete coverage by detailed contour maps makes it impossible to present a complete and precisely accurate map of average slope. Steepness of slope, like local relief, increases from the periphery toward the Mississippi Gorge, as does the seriousness of soil erosion.

In constructing the Average Slope Map (Fig. 3) the Wentworth method

of determining slope from contour maps was followed.[3] Each quadrangle, scale 1/62500, was divided into five-minute quadrangles and the contours were counted along north-south, east-west, and diagonal traverses.

The map of Lithic Character (Fig. 5) is a geographic, not a geologic, map. It was constructed for the purpose of supplementing and supporting the Physiographic Diagram (Fig. 1), particularly in the matter of cuesta development.

CONCENTRIC CUESTAFORM PATTERN OF PRINCIPAL FEATURES

Further distinction accrues to the region by reason of its conspicuous cuestaform pattern of alternating dip-slope surfaces and bordering escarpments. The structural axis of the Wisconsin Arch, on whose western flanks the Cuestaform Hill Land lies, trends almost north south, through the center of the southern half of Wisconsin. Alternating beds of resistant dolomite and weaker sandstones and shales dip west and southwest at a slight angle (in most places less than 15 feet per mile) from the crest of the Wisconsin Arch, forming a series of cuestas whose digitate escarpments face east-northeast with gentler dip slopes descending to the southwest (Figs. 5 and 1). In many sections the cuestas are so dissected that escarpment form is not easy to perceive. Four crescentic-shaped cuestas are to be observed. In the three outermost ones the crests of the cuestas are developed on resistant dolomites—Niagara, Galena-Platteville, and Lower Magnesian. The innermost one is associated with the relatively impervious, shaley, and limey Franconia formation within the Cambrian. Between the resistant dolomites are weak shales and sandstones which floor the lower portions of the intervening vales or lowlands and comprise the basal and less precipitous portions of the escarpments as well.

Within the Cuestaform Hill Land there are strong contrasts in the degree of dissection, with corresponding variations in the proportions of upland, valley bottom, and intervening hill land. For the region as a whole slopes predominate (Fig. 3), but even though this be true, a striking and persistent feature is the prevalence of distinct summit levels (Fig. 1). In some sections summit areas are so narrow that when on them one has the feeling of being isolated and above the country level. In other sections the

[3] The method used here is that devised by Wentworth and given cartographical application by Smith. See C. K. Wentworth, "A Simplified Method of Determining the Average Slope of Land Surfaces," *Amer. Journ. of Science*, Series 5, vol. 20, 1930, pp. 184–194.

Guy-Harold Smith, "The Morphometry of Landscape: An Analysis of Slope" (abstract), *Ann. Assoc. Amer. Geogrs.*, vol. 28, 1938, pp. 63–64. "The Morphometry of Ohio: The Average Slope of the Land" (abstract), *Ann. Assoc. Amer. Geogrs.*, vol. 29, 1939, p. 94.

upland surface is so extensive that *it* is the country level, and the incised valleys are the isolated features. Characteristically it is where the resistant dolomites have recently been removed and sandstone is the surface stratum that summit levels are least conspicuous and acute ridges and conical hills are common.

An extensive view from many parts of the upland surface gives the impression of an even skyline in all directions. But this impression of a level plain is a mirage that retreats before the observer's advance so that he never overtakes it. The summit levels are by no means flat; on the contrary they usually have considerable relief, and the illusion of a level plain in the distance is simply the blending of the crests of a number of isolated ridges or uplands having similar elevation, none of which even approaches flatness.

PENEPLAINS

This phenomenon of distinct summit level or levels within the Cuesta-form Hill Land introduces the peneplain problem which has been debated for many years. The controversy resolves itself into whether the rolling uplands of the region are (1) remnants of old erosion surfaces associated with different base-levels than that of today, or (2) simply the dip-planes of slightly tilted beds of resistant dolomite. Martin has discarded the peneplain theory entirely and is convinced that surface features of the Driftless Area have been developed by differential erosion during the *present* cycle.[4] Trowbridge has advanced the hypothesis of two peneplains, an upper and less extensive one that includes the cuesta crests, and a lower one that includes all the dolomite uplands except the cuesta crests and some of the principal divides as well.[5] Thwaites has recently suggested the existence of *one* mature erosion surface with a relief of about 200 feet that is essentially Trowbridge's lower peneplain.[6] A comprehensive review, and further field and laboratory study, of the problem by Bates has led him to conclude that there are within the Driftless Area remnants of only *one* peneplain, but in contrast to Thwaites' hypothesis, this is the upper one of Trowbridge.[7] The principal evidence substantiating Bates' contention is the beveled crests of the dolomite cuestas. He admits the possibility that

[4] Lawrence Martin, *The Physical Geography of Wisconsin*, Bull. XXXVI of Wis. Geol. and Nat. Hist. Survey, second edition, Madison, 1932, pp. 69–77.

[5] A. C. Trowbridge, *The Erosional History of the Driftless Area*, Univ. Iowa Studies, First Series, No. 40, 1921, Studies in Nat. Hist., vol. 9, No. 3. *Guide Book, Ninth Annual Field Conference, The Kansas Geological Society*, Wichita, 1935, pp. 62, 75.

[6] *Ibid.*, pp. 110–120.

[7] Robert E. Bates, "Geomorphic History of the Kickapoo Region," Wisconsin, *Bull. Geol. Soc. of America*, vol. 50, June, 1939, pp. 819–880.

other lower parts of the upland may be the results of an incomplete erosion cycle earlier than the present. No one disputes the presence of cuestas; it is chiefly a question of how much their back slopes represent simple strip plains, or on the other hand, are due to peneplanation.

DRAINAGE PATTERNS

A relatively simple dendritic drainage pattern prevails. The entire region is asymmetrically bifurcated by the Mississippi Gorge, whose precipitous walls drop 250 to 650 feet below the upland level. All other drainage lines are adjusted to that of the deeply entrenched masterstream. River, swampy floodplain, and gorge in combination form a remarkable natural barrier which, in conjunction with the state boundaries that coincide with the channel, prevent the Driftless Cuestaform Hill Land from functioning as a cultural unit. Dependent upon structure and lithic character, the gorge is variable in width, depth, and the nature of the limiting walls. Where the Mississippi crosses the crest of a western arm of the Wisconsin Arch in the vicinity of Trempeleau the gorge is almost entirely in weak Cambrian sandstone, and here it reaches its maximum width ($6\frac{1}{2}$ miles) and depth (600+ feet). Both to the north and south of Trempeleau as the resistant dolomite declines in elevation the gorge becomes increasingly narrow, with the greatest constriction occurring where the Lower Magnesian dips below the grade of the river, as it does just below the mouth of the Wisconsin, and again at Prescott near the mouth of the St. Croix. In general the gorge walls are precipitous where the more resistant strata prevail and steeply sloping on the weaker rocks. Glacial outwash fills the gorge to a depth of 100 to 200 feet, so that the preglacial trench was more impressive than the present one. Numerous terrace fragments, remnants of this outwash filling, Wisconsin in age, occupy variable proportions of the Mississippi bottomland and rise from 20 to 100+ feet above the present floodplain. These Pleistocene terraces are the almost universal sites for nucleated settlements within the gorge.

It goes without saying that the Mississippi Trench is an abnormal development. Its relatively steep walls and straight course, together with the youthful character of its smaller tributaries, suggest the stage of late youth in erosion history. The complicated history of the Upper Mississippi is far from being solved. A relatively recent suggestion is that in pre-Nebraskan time the river occupied a channel 50 to 75 miles westward of its present course. This is substantiated by the discovery beneath the drift mantle of a shallow sag in the bed-rock surface which enters Iowa from Minnesota about 75 miles west of the present river and extends to the southeastern corner of the former state. This sag is some 200 feet lower than the rim of the present gorge. With the southeasterly advance of the Nebraskan ice

the Mississippi probably was forced out of its preglacial channel and took up its present course which marks the eastward edge of Nebraskan ice and drift.[8] Shortly after this event the region was uplifted and the erosion history of the present drainage lines was begun.

While the general drainage pattern of the region is simple dendritic, numerous individual streams have unique and distinctive characteristics. Intrenched meanders in most perfect development are characteristic of the Kickapoo, a southward flowing tributary of the Lower Wisconsin. Similar features are to be observed in other small rivers of southwestern Wisconsin and parts of adjacent states. To some this is further evidence of peneplanation, while others find an explanation in the influence of joint-planes or local variations in the resistance of rock.

Due to alternating beds of weaker sandstones and shales, and more resistant dolomites, river valleys are likely to contain benches and be two-storied in aspect (Fig. 7). In the weaker strata they widen out and their

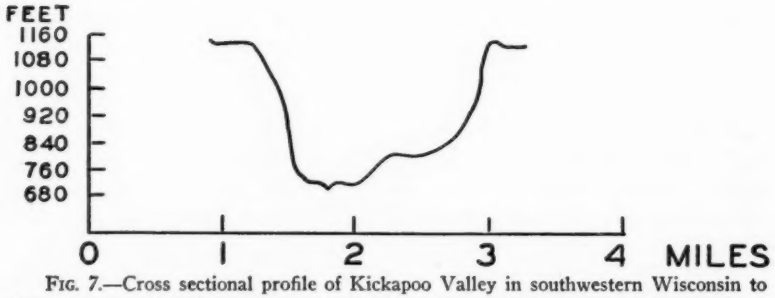


FIG. 7.—Cross sectional profile of Kickapoo Valley in southwestern Wisconsin to show the characteristic development of rock terraces. Profile located between Gays Mills and Soldiers Grove. Gays Mills Quadrangle.

walls are less abrupt, while steeper sides and narrower floors are characteristic where limestone is encountered. The alternation of resistant and non-resistant strata also results in numerous vertical cliffs and "mural escarpments with castellated outliers." In longitudinal profile many valleys show relatively mild slopes throughout most of their lengths, only to rise abruptly at their headwaters in an amphitheater of hills to the general dolomite summit level (Fig. 8).

Certain peculiarities of drainage pattern are associated with cuesta development. West of the Mississippi in Iowa and Minnesota where the cuestas trend NW–SE there is a tendency for many of the shorter streams to meet the Mississippi at right angles or, in numerous instances, to flow northeastward meeting it at an obtuse angle. Interior and beyond the region of cuesta influence rivers have a normal NW–SE trend. Kay and

[8] *Guide Book cit.*, pp. 74–76.

Apfel point out that in Iowa more than three-quarters of the immediate west valley wall of the Mississippi is drained directly to the river through creeks so that the main drainage basins are constricted near their lower ends and flare markedly some 10 to 30 miles above the junction with the Mississippi.[9]

Of the rivers to the east of the Mississippi, the lower Wisconsin is the most unusual. It flows in a gorge resembling that of the Mississippi and like it narrows toward the mouth as more and more of the total height of its limiting walls are of resistant dolomite. The abrupt, nearly right-angled bend of the Wisconsin near Merrimac is distinctly abnormal. Throughout the lower part of its course the river flows parallel to the Galena-Platteville Escarpment in what is probably a subsequent valley. It seems likely also that the lower Wisconsin is a diverted river resulting from stream capture.

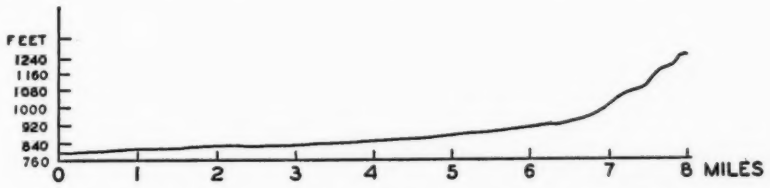


FIG. 8.—Longitudinal profile of East Branch, a tributary of Mound Creek, Dane County, Wisconsin. Shows the characteristic marked steepening of gradient near the heads of many valleys in the Driftless Hill Land. Blue Mounds Quadrangle.

THE DIVIDES

The ridges are merely the complements of the dendritic system of drainage lines sunk below the upland levels. The almost classic description of ridge forms in the Driftless Area by Chamberlin and Salisbury is here presented.[10] "A typical ridge of the region consists, therefore, of a central elongated elevation more or less irregular whose sides are flanked by a series of spurs, themselves supported by secondary spurs, so that the main ridge is buttressed and rebuttressed, until the series terminate in points jutting out into the adjacent main flanking valleys." These same authors describe a typical ridge as resembling "a deeply-lobate compound pinnated leaf." It is more especially the sandstone areas that depart from the above description. There the low resistance of the formations permits such rapid degradation that the interfluves have been cut back to sharp concave ridges often deeply dissected and developing acute conical peaks. Where the surface

[9] George F. Kay, and Earl T. Apfel, "The Pre-Illinoian Pleistocene Geology of Iowa," *Iowa Geol. Survey*, vol. XXXIV, 1928, p. 34.

[10] T. C. Chamberlin and R. D. Salisbury, "The Driftless Area of the Upper Mississippi," *Sixth Annual Report of the U. S. G. S.*, 1884–1885, pp. 205–328 (234–235).

sandstones are unusually weak and likewise homogenous in character a rolling terrain, almost sag-and-swell in appearance, may prevail.

SECTIONAL CHARACTERISTICS AND BOUNDARIES

Although surface configuration within the Driftless Cuestaform Hill Land has strong unifying characteristics which are common to the region as a whole, there are on the other hand sectional differences of importance.

In that part of the region lying east of the Mississippi, four somewhat contrasting subdivisions are recognized: (1) the Northern Lower Magnesian Upland lying between the Chippewa River and the Wisconsin End Moraine, (2) the Dolomite Ridge-Franconia Bench section between the Chippewa and La Crosse rivers, (3) the dissected Lower Magnesian Upland between the La Crosse River and the Galena-Platteville Escarpment just south of the Wisconsin River, (4) the Galena-Platteville Upland from the escarpment of the same name south to, and including, the Niagara Escarpment in northern Illinois (Fig. 1).

The Northern Lower Magnesian Upland

In the northernmost part of the Driftless Hill Land (largely in Pierce and St. Croix counties) is an extensive flattish upland developed principally on resistant Lower Magnesian dolomite (Figs. 1, 2 and 5). It is especially in the eastern part of the upland that a strikingly flattish surface is so conspicuous. Here over extensive areas one has difficulty in detecting the scars of drainage channels so that the possibility of subterranean removal is suggested. No doubt deposition by pre-Wisconsin ice sheets accounts in part for the lack of surface irregularities. In spite of the drift being relatively old (Illinoisan and Kansan), the close proximity of pre-Cambrian rocks explains the numerous crystalline boulders strewn over the upland surface, especially its eastern part.

Over the western half of the area tabular uplands and mesa-like hills capped by Galena dolomite rise sharply above the general Lower Magnesian surface (Figs. 1 and 5).

The boundaries of the Cuestaform Hill Land in this northern subdivision are moderately distinct and definite. On the east it is the Lower Magnesian and Franconia escarpments that separate the region from the Central Plain of Wisconsin. In Pepin and southern Dunn counties where the Franconia bench is very narrow and the two escarpments are close together their combined relief makes for a marked northward finger-like projection of the 400-foot local-relief isarithm (Fig. 2). Farther north where the discontinuous Franconia bench is wider, the two escarpments diverge, so that descent from the Lower Magnesian Upland is less abrupt than it is to the

south. It may well be that a thicker drift cover father north likewise tends to lessen relief.

Due probably to glacial action the escarpment front is somewhat less irregular than is true of those in unglaciated sections farther south, although it is still far from being regular (Figs. 1 and 4). Commonly the escarpment's marginal belt of interdigitated salients and embayments is from three to five miles in width.

It is a debatable question whether the boundary of the Driftless Hill Land should remain fairly close to the edge of the dolomite or on the other hand be swung eastward so as to include an extensive part of the Eau Claire Bench enclosed by the local relief isarithm of 300 feet (Figs. 1 and 2). Since in this section (northern Dunn County) the Franconia Bench exists chiefly in the form of isolated ranges and groups of hills rising conspicuously above the lower and flatter Cambrian Plain (here called the Eau Claire Bench), the decision has been against including it.

The northern boundary of this subregion, and of the Driftless Hill Land as well, is not primarily one of relief but rather is the end moraine of the Wisconsin ice sheet. Because of the recent till cover the northern edge of the dolomite does not have a prominent morphological expression.

The Dolomite-Ridge Franconia-Bench Section

Lying between the Chippewa and La Crosse rivers is a subdivision of the Driftless Hill Land in which dissection has been so complete as to have nearly obliterated the original Lower Magnesian Upland surface (Figs. 1 and 5). It stands markedly in contrast, therefore, to the region just described. No remnants of the younger Galena-Platteville or St. Peter formations are to be observed. Indeed, even the Lower Magnesian dolomite has disappeared from over much the larger part of this section and only in its western portion is surface configuration affected by dolomite strata. Over a much larger part, and especially to the east, Cambrian sandstone provides the material out of which the land forms are fashioned (Fig. 5). This is the Franconia Cuesta (Fig. 1).

The reasons for the greater dissection of the land, and the development of surface features upon distinctly earlier and lower rock formations as compared with the section to the north is related both to structure and to the presence of major drainage channels. Because of the western protuberance of the Wisconsin arch which crosses the Mississippi in this locality, the several formations are found at relatively higher elevations. As a consequence the Mississippi has cut completely through the resistant Lower Magnesian dolomite and is deeply entrenched in the weaker Cambrian sandstones. As noted previously, the gorge here reaches its maximum depth

and width and then narrows and shallows to the north and south as dolomite again approaches and finally goes below the grade of the river. Not only the masterstream, but the tributaries as well, have opened up broad valleys in the weak sandstone, particularly in La Crosse and Trempeleau Counties.

The fact that four major tributaries of the Mississippi, the Chippewa, Trempeleau, Black, and La Crosse rivers, cross the subregion probably is additional reason for the more rapid removal of the protective dolomite and the more complete dissection of the terrain. Moreover, since only the northernmost edge of this section has been encroached upon by continental ice sheets, and those of pre-Wisconsin age, there is lacking that simplification of forms resulting from glacial erosion and deposition (Fig. 4).

Two distinct and well separated cuestas, the Lower Magnesian and the Franconia, are observable (Fig. 1). The dolomite cuesta, lying closer to the Mississippi, is represented by isolated, sinuous, even crested ridges rather than by distinct uplands. Its escarpment, therefore, is so completely digitate as to almost defy accurate location. In fact, in parts of Trempeleau and La Crosse counties the escarpment is located by means of isolated outliers of the dolomite rather than by spur ends. Three distinct levels are conspicuous in the Lower Magnesian Cuesta. Highest in elevation are the crests of the dolomite ridges whose craggy, castellated margins mark the steep descent to the rolling surface of the fringing Franconia bench, which in turn drops off sharply to the valley floors.

On the Franconia Cuesta, lying east of the Lower Magnesian, the relief forms are less angular and abrupt. A distinct but lower upland level still prevails, although the crest is more rounded and the margins distinctly less precipitous, while river valleys are wider. Multiple minor benches developed on Cambrian members of varying resistance are characteristic.[11] The Franconia Escarpment is relatively distinct although markedly irregular and characterized by numerous deep embayments and projecting salients, and by hundreds of detached outliers. Varying from 150 to 300 feet in height, the escarpment forms the boundary between two regions of marked contrasts, *viz.*, the flattish Cambrian Plain to the east and northeast and the irregular surface of the Franconia Bench to the west and south, where local relief in general exceeds 300 feet. Here steep relief gradient sharply defines the boundary of the Driftless Hill Land.

The Dissected Lower Magnesian Upland between the La Crosse River and the Galena-Platteville Escarpment

Farther advanced in the erosion cycle than section one north of the

[11] Guy-Harold Smith, *The Influence of Rock Structure and Rock Character upon Topography in the Driftless Area,* Ph.B. Thesis, University of Wisconsin, 1921.

Chippewa River, but less so than section two just described, this subdivision is intermediate in its landform characteristics (Fig. 1). Declining in elevation toward the south, following the dip of the rock, at the rate of four to six feet per mile, the upland surface approximates 1300 to 1400 feet in elevation along the northern margin as compared with 1100 to 1150 feet just north of the Wisconsin River. The westerly as well as southerly dip of the formations causes the dolomite ridges to be broader and more continuous to the west, in spite of the closer proximity of the masterstream (Fig. 1). In fact in western Crawford and Vernon counties in the apex of the V formed by the Mississippi and Wisconsin rivers, isolated hills and more extensive ridges capped with Galena-Platteville dolomite rise above the relatively continuous Lower Magnesian upland. Their total area is small, the most continuous fragment being a portion of the interfluve between the Kickapoo and Mississippi rivers in southwestern Crawford County, where the Galena-Platteville ridge is 20 to 25 miles long (Figs. 1 and 5). This ridge is a part of the Galena-Platteville Cuesta that has been separated from the main upland by the Wisconsin River. Surrounding the Galena-Platteville ridge and overlying the Lower Magnesian, weak St. Peter sandstone covers more extensive areas, giving rise to a distinctive billowy type of surface.

Compared with the western and southwestern portions of the section, the eastern half is more dissected and the dolomite upland level is much less extensive. This part resembles more the section north of the La Crosse River. Throughout the section numerous benches and two-storied or terraced valleys are conspicuous. The benches are rock terraces resulting from the unequal resistance of various Cambrian members. Especially is the Kickapoo Valley famous, not only for its rock terraces, but for its perfectly developed intrenched meanders as well (Fig. 7).

Two escarpments, the Lower Magnesian and the Franconia, are present in the eastern part of the section, the latter marking the boundary of the region. Since the Franconia Bench is narrower here than it is north of the La Crosse River, the two escarpments are closer together. On the map of local relief the Franconia Escarpment is approximately delimited by the steep relief gradient indicated by the close spacing of the 200- and 300-foot isarithms (Fig. 2). For the Lower Magnesian Escarpment the 400-foot isarithm of local relief is the approximate line of demarcation.

At the southeastern corner of this section is famed Baraboo Range, an exhumed monadnock of pre-Cambrian quartzite. Here relief reaches one of the two 800+ feet maxima for the entire Driftless Hill Land.

The Galena-Platteville Upland

From the Galena-Platteville escarpment, or Military Ridge, extending

southward into northwestern Illinois, is a southwestward inclined cuesta surface developed largely upon the dip slope of the Galena-Platteville dolomite.[12] Weak Richmond shale covers conspicuous areas on the southernmost parts of the cuesta from which the Niagara dolomite has recently been removed. East-west Military Ridge at the north may be the continuous and relatively undissected crest of the cuesta, or possibly the remnant of a peneplain. Four or five southward flowing streams have incised relatively deep and steep sided valleys into the upland. Since they are for the most part cutting in resistant dolomite the rivers have widened their valleys but slowly. As a result the cuesta upland has been longer preserved and is recognized as the country level (Fig. 1). Relief is lower, slopes are less steep, and soil erosion less of a problem than in the subdivision just north of the Wisconsin River (Figs. 2, 3 and 6). Not uncommonly the rivers have cut through the Galena dolomite and the weak St. Peter sandstone into the Lower Magnesian dolomite below. The St. Peter, variable in thickness and resting upon an uneven dolomite surface, has a variety of morphological expressions. Where it is thick, valleys tend to be narrower. Moreover the sandstone tends to make prominent low cliffs in the valleys so that a cross-sectional profile shows the sloping shoulders of limestone dropping off suddenly at the edge of the sandstone. In contrast to the three northern subdivisions, the Franconia Cuesta with its distinctive surface forms is absent in the section south of the Wisconsin river.

From a distance the upland appears to be a smoothly sloping plane surface, but closer inspection shows that this is misleading. In reality the broad undulating and rolling interfluves descend gently from a central divide toward the drainage lines. Above the general level of the Galena Upland rise a number of mounds capped with Niagara dolomite. These remnants of the southward retreating Niagara Escarpment vary in height from 180 to over 400 feet above the country level. Where surface forms are developed on weak Richmond shale, billowy, rounded features, somewhat higher than the country level are characteristic.

The Galena-Platteville dolomite is significant as an ore-bearing formation, chiefly of lead and zinc. It was the presence of shallow lead deposits in this section of the Driftless Hill Land south of the Wisconsin River that led to some of the earliest settlements in the Upper Mississipppi Valley region.[13]

The northern boundary of the sub-region is the irregular and much in-

[12] U. S. Grant and E. F. Burchard, Description of the Lancaster and Mineral Point Quadrangles. U. S. Geol. Survey, *Geol. Atlas, Folio 145*, 1907.

[13] Glenn T. Trewartha, "A Second Epoch of Destructive Occupance in the Driftless Hill Land," *Ann. Assoc. Amer. Geogrs.*, vol. 30, 1940, pp. 109–142.

dented Galena-Platteville Escarpment which averages 100 to 200 feet in height. Flowing parallel with the escarpment for a considerable distance the Wisconsin River occupies a gorge incised some 300 to 400 feet below the Galena upland. Not more than one half of this elevation should be thought of as escarpment, however. The eastern and southeastern boundary of the upland is fairly coincident with the transition from driftless to drift-mantled surface, and this in turn is roughly coincident with a decrease in local relief (Fig. 2). Along the northeastern margin where the drift is Wisconsin in age, the relief gradient is relatively steep. Farther south, where the drift is probably Illinoisan in age, the belt between the 200- and 300-foot isarithms broadens markedly and the relief gradient is weak.

The Niagara Escarpment in northwestern Illinois not only is the southern boundary of the Galena-Platteville Upland, but may also be thought of as a distinctive subdivision of that section. Here the Niagara formation is in the nature of a northward projection from the main mass and its maximum thickness does not exceed 100 to 150 feet.[14] The escarpment is in the form of a series of long, narrow, and intricately lobate ridges existing as interfluves bteween a number of small streams. Some of the Niagara ridges are as much as 10 to 15 miles long and only a fraction of a mile in width. Other than the valley bottoms, two levels are conspicuous, the deeply incised Galena-Platteville Bench and the much less extensive Niagara ridges separated by apron-like slopes developed on the intervening shale.

The Driftless Hill Land in Iowa and Minnesota

West of the Mississippi the variety of subregions is not so plentiful as it is in Wisconsin and Illinois. Cuesta forms are unusually conspicuous however and there is a striking belted arrangement of northeastward facing escarpments with intervening dip-slope plains (Fig. 1).

At the southern limit of the Driftless Hill Land the Niagara dolomite forms the upland surface up to, and including the bluffs overlooking, the Mississippi floodplain. Northward from that point the Niagara escarpment increasingly drops back from the Mississippi Bluffs and a narrow lower bench developed on Galena-Platteville dolomite borders the gorge. This bench widens to the north until at a point a little north of the mouth of the Wisconsin River the Galena Escarpment swings westward from the river and a third bench, the Lower Magnesian, makes its appearance. Thus belts of rugged escarpment terrain alternate with dip-slope plains in which relief is markedly less. On the map of local relief (Fig. 2) the Niagara Escarpment

[14] Arthur C. Trowbridge and Eugene Wesley Shaw, *Geology and Geography of the Galena and Elizabeth Quadrangles.* Bull. 26, Illinois State Geol. Survey, Urbana, 1916. Also U. S. G. S., *Geol. Atlas, Folio 200.*

in Iowa is conspicuously revealed by the northwesterly projection of the 400 and 500 foot isarithms in Clayton and La Fayette counties. Northeast of the Niagara Escarpment on the Galena dip slope relief declines to less than 200 feet. On the Average Slope Map (Fig. 3) this pattern is hidden by the particular isarithms employed. If a 6-percent instead of 5-percent isarithm had been used, the escarpment with its bordering vale would stand out clearly. For southeastern Minnesota the dearth of topographic sheets, and the consequent necessity of employing less refined data in constructing that part of Figure 2, make it more difficult to detect the belted arrangement of escarpments and plains on the relief map.

The Niagara Escarpment gradually decreases in height toward the north and disappears entirely in the northern tier of counties of Iowa. Here and in Minnesota the Niagara dolomite is overlain by weak Cedar Valley limestone which is not a cuesta maker. Thus in northern Iowa and southeastern Minnesota, the Galena-Platteville is the oldest and innermost escarpment, with the Lower Magnesian forming the bluffs along the Mississippi and its tributary valleys.

In both Iowa and Minnesota the Driftless Area gradually has been shrinking in extensiveness and retreating eastward as patches of very ancient till have been discovered closer and closer to the Mississippi. Late geological maps of Iowa now show no part of the Driftless Area in the northeastern part of the state. This may also be the case with Minnesota, although the geologists of that state have not reported till within a very restricted section of southeastern Minnesota.[15] Patches of what may be old till have also been observed east of the Mississippi in extreme northwestern Illinois.

Most, if not all, of the Driftless Hill Land in Iowa and Minnesota has been covered by ancient ice sheets, although the till cover is relatively inconspicuous. In the region designated as Nebraskan till in Iowa, and Nebraskan and driftless in Minnesota, landforms appear to be quite unrelated to the work of ice (Fig. 4). Without much doubt they are post-Nebraskan in their development. It is this region that was formerly designated as a part of the Driftless Area.

But the belt enclosed between the 200- and 300-foot local-relief isarithms in general lies west of region of Nebraskan drift so that the Driftless Hill Land includes those portions of northeastern Iowa and southeastern Minnesota having deposits of Kansan drift (Fig. 4). This region is not sharply separated from the Nebraskan drift area farther east, although the boundary is fairly definite. By reason of the loess deposit of variable thickness that mantles the erosion features, a distinctive surface configuration characterizes

[15] Frank Leverett, *Quarternary Geology of Minnesota and Parts of Adjacent States*, U. S. Geol. Survey, Prof. Paper 161, 1932.

the region of Kansan drift. On the uplands the loess is relatively thin, usually not over 10 feet thick, but attains depths of 30 to 40 feet bordering valleys. It gives rise to what Alden and Leighton have called "mantled mature erosion topography."[16] The main features of a mature dendritic drainage system are present but minor branches are lacking. Characteristically the headwaters of drainage lines are in broad shallow swales which merge almost imperceptibly into the flattish upland surfaces. On the other hand, in their lower courses the valleys deepen remarkably. The divides are gently rolling, the principal slopes conforming to the underlying erosion surface but with modifications and minor features imposed by the loess mantle. On the erosion slopes, where the loess is thicker, more distinct modifications are present. Here dune-like accumulations of loess and sand in the form of rolling hills result in undulating convex and concave curves and a multiplication of slopes. The shoulders of the hills are rounded by loess accumulations with the result that their lower slopes are steepened. On the whole, relief is somewhat increased. Due probably to the prevalence of westerly winds the eastern slopes of valleys have the deeper loess accumulations.

The western boundary of the Driftless Hill Land is not a simple one. Except toward the northern end of the region in Minnesota, the local-relief isarithms of 200 to 300 feet satisfactorily define the boundary. The relief boundary in turn coincides with the crest of the Niagara Cuesta as far north as the latter extends, and beyond that follows closely the Galena-Platteville escarpment. In parts relief gradients are steep and the boundary, therefore, sharply defined. The fact that the eastern limits of early Wisconsin drift (Iowan) likewise closely corresponds for considerable distances with the Niagara and Galena-Platteville escarpments tends to increase the relief gradients and more sharply define the region's boundary (Fig. 4). Where the Wisconsin drift lies east of the Galena-Platteville escarpment as it does along the northern half of the region's boundary in Minnesota (Goodhue, Dodge, and New Olmstead counties) escarpment relief is considerably diminished. In this section the eastern edge of early Wisconsin drift is accepted as the boundary of the Driftless Hill Land.

Madison, Wisconsin, and Columbus, Ohio.
March, 1940.

[16] George F. Kay and Earl T. Apfel, *op. cit.*, pp. 56–58.

Almon Ernest Parkins

J. RUSSELL WHITAKER

It is particularly fitting that recognition of the services of Almon Ernest Parkins in the field of geography should be given at this meeting of the Association at a southern center of geographic study, for he served both the Association and the Region well and long. In his passing, January 3, 1940, the South lost the dean of its geographers, and the Association one of its distinguished members.

Almon Ernest Parkins will doubtless be remembered as one of the more representative of American geographers of the first half of the Twentieth Century. In his training, in his teaching, in the results of a productive career, and in his friendships he influenced and was influenced by contrasted sections and the entire country.

Dr. Parkins was born in Marysville, Michigan, January 10, 1879. He was graduated from Michigan State Normal College, Ypsilanti, Michigan, in 1906. There he majored in geography under Mark Jefferson, whom he loved to quote, and whose ideas he delighted to give further circulation. In 1914, he received his doctorate from the University of Chicago, where he studied with many of the men who have made American Geography. Perhaps more often than of any others, he spoke of Salisbury and Barrows in referring to that period.

His early years of teaching were in western Michigan. First teaching chemistry, he ever after favored somewhat the contacts of geography with that field. When he returned to Ypsilanti after some teaching, there was a struggle between his liking for chemistry and for geography. I have reason to believe that it was the remarkable ability of Jefferson to make geographic study such high adventure that cast the decisive weight on the side of that discipline.

In 1914, Mr. Parkins was appointed instructor in agricultural geography at the University of Missouri. Two years later he became professor of geography at George Peabody College for Teachers, Nashville, Tennessee, where he remained until his death. There he taught and wrote, leaving an indelible stamp on the teachers and geographers of the South and on the geographic literature of that section. His contributions to the geographic

ALMON ERNEST PARKINS, 1879–1940

literature of that area were, happily, brought to some measure of consummation in his book, *The South,* published in 1938.

Dr. Parkins' services to and through Peabody College deserve special recognition. He made the welfare of the College and of the section in which it is located his ruling objective. When there was difficulty, for example, in keeping the college library open during his early years there, he took his turn daily for an hour or so at the desk of the librarian. In these and a multitude of other ways, his life ran out through every avenue of college activity. The College, in turn, gave him an enviable opportunity to come in contact with a great number of young men and women who were to serve in the colleges and schools of the South and of the entire nation. To these he brought geography during years when professional geographers were few enough in America, and even scarcer in the South.

At Peabody, he sought to uphold the traditions of a graduate institution through his own activities in original scholarship, and of a college of education by his attention to the educational aspects of geography. His writings reveal the desire to serve at all points in the propagation of the best of geographic truth, from the discovery of basic knowledge of human significance to the dissemination of that knowledge. In editing the book on *The Teaching of Geography,* published by the National Society for the Study of Education, he helped to strengthen the position of Geography in the public schools at a relatively critical time.

Although reflecting and contributing directly to the life of two great sections of the nation, Dr. Parkins, as befits a geographer, was national and international in outlook. His texts and school maps reveal an international view, and much of his unfinished work dealt with problems in international relations. On the other hand, his share in the preparation of college books devoted to the United States give him a prominent place among those who have contributed notably to the understanding of the entire American scene. As a national figure, he held positions of importance. He was president of this Association in 1930, and editor of its *Annals* for six years. He was a guiding force in the National Council of Geography Teachers, was an associate editor of their official publication, *The Journal of Geography,* was president of the National Council of Geography Teachers in 1925, and received its Distinguished Service Award in 1934. Prophetic of view, impatient with needless delay, he was ever leading the way into new lines of usefulness.

His enthusiasm for his work was tempered with a keen sense of humor. This, and a high regard for realism, doubtless accounts for his failure to speculate very much on the philosophy of geography and its theoretical

limits. His favorite expression when this question came up, "Geography is what geographers do," was not as far as he could go, however, for his paper "The Geography of American Geographers" shows that he had all of the arguments well in hand. This realistic attitude doubtless helped to save him from the palsy which may come from thinking overly much on objectives and means.

Professor Parkins' humor and enthusiasm endeared him to his students. They were attracted, too, by his perennial youthfulness and by his devotion to their welfare. Perhaps the chief characteristic which accounted for his popularity among the student body was that of fairness and impartiality in the conduct of his classes. He expected his students to prepare the assignments and justly appraised their work. Among the more delightful hours the students spent with Professor Parkins were those during week-end field trips. He was both the professor and the genial leader on such occasions. His home, moreover, was the scene of many dinner parties and outdoor picnics given for his geography students, who will long remember them as happy experiences that strengthened already strong friendships.

To recall Dr. Parkins as he went about his daily work is to remember his ceaseless but purposeful activity, his wide-ranging interests, his eager acceptance of suggestions for improvement, and his devoted attention to his students. In every possible way, in teaching, in writing, in directing the work of others, he sought to contribute to the life about him. In the words of the late Professor R. H. Whitbeck, "He has an honored place among the more useful men in the field of geography and geographical education in America."

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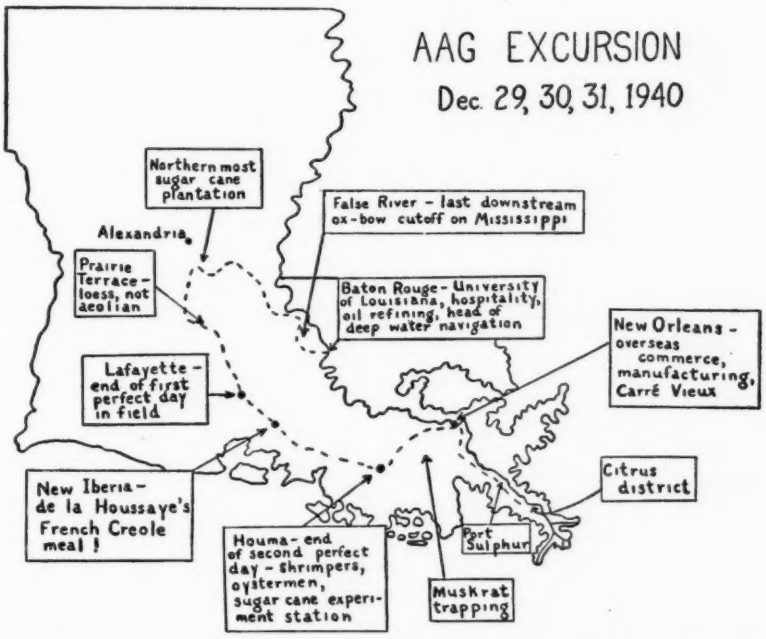
George Peabody College,
February, 1941

Field Excursion Following the Baton Rouge Meeting


AAG EXCURSION
Dec. 29, 30, 31, 1940
Northern most sugar cane plantation
False River - last downstream ox-bow cutoff on Mississippi
Alexandria
Prairie Terrace - loess, not aeolian
Baton Rouge - University of Louisiana, hospitality, oil refining, head of deep water navigation
New Orleans - overseas commerce, manufacturing, Carré Vieux
Lafayette - end of first perfect day in field
Citrus district
New Iberia - de la Houssaye's French Creole meal !
Houma - end of second perfect day - shrimpers, oystermen, sugar cane experiment station
Port Sulphur
Muskrat trapping

God, or the weather man, or the physical forces which produce and move cold and warm air masses and make weather in southern Louisiana, was (or were) kind to the forty or fifty geographers who survived the two days of papers at Baton Rouge and had enough energy and interest and cash to take advantage of the field excursion. Weeks of almost continuously rainy weather had preceded the Baton Rouge meetings. Soon after the termination of the excursion a "norther" made outdoors unattractive in a different but typically Gulf Coast winter manner. But during the three days of excursion the sun shone and the air was delightful as to temperature. One midday was warm enough for shirt sleeves.

Local Committee R. J. Russell and F. B. Kniffen of Louisiana State University had worked out, and Secretary P. E. James had announced to

the membership, weeks in advance, an intriguing three days in the field. Actually the experience far exceeded what one might have expected from the announcement. The bus had not been rolling more than an hour from the University campus when it became evident that the Louisiana geographers knew their onions and also knew how to prepare delectable intellectual soup therefrom.

The territory traversed was entirely new to most of the group, but we had been well prepared to look at it in the field by a series of papers presented the morning of the first day of indoor meetings. These papers (listed below) are abstracted under the several authors' names on pages 55–75 of this number of the ANNALS.

Richard J. Russell: Physiographic Regions of Louisiana
J. Fielding Reed: The Soils of Louisiana
E. M. West: Louisiana Vegetation Regions
J. Harvey Roberts: Louisiana Animal Geography
A. C. Albrecht: The Historic Indians of Louisiana
J. S. Kyser: Louisiana Demography
Peveril Meigs, 3rd: An Ethno-telephonic Survey of French Louisiana
W. J. Parenton: French Louisiana
R. J. Saville: Agricultural Regions of Louisiana
Pierre Crabites: Louisiana Foods

A detailed, interesting, and informative mimeographed "log" was in the hands of each person on the excursion. An excerpt, reproduced herewith, samples the variety and exactness of its guidance.

Log, first day, mile 32 to mile 75.

32.1 L The old type of French high plantation house.
The most prosperous plantations are situated on old crevasse channels. Such a situation meant greater freedom from flooding in the pre-levee days, and it means greater depth of alluvium in the back-swamp and a greater area of cultivable land.

33.5 L Austerlitz plantation house.

34.7 L Parlange plantation house, built about 1760. Old French type. Observe octagonal brick dovecotes or pigeonniers.

35.7 L Ramsey plantation. Stop to inspect house and grounds. Permission courteously granted by Mr. Wurtele, inventor of mechanical cane harvester.

36.6 L Cotton gin.

39.3 L Pecan orchard.

40.0 Enter city limits of New Roads, the modern equivalent of the Pointe Coupee "coast" of earlier days, now lost to the river.

40.8 Turn left in New Roads on La. 30.

41.0 R Cemetery with vaults above ground.

41.3 The trip ahead shows characteristic Mississippi flood-plain features. Note dark soils. Sugar cane, cotton, corn, truck crops, and large sections unproductive.

45.0 L Potato-packing shed.
Built-in-porch type house still prominent though shotgun type becoming important.

48.0 Labarre, stop on T. & P. Ry.

48.7 Beginning of crevasse topography; Mississippi at right. Note crevasse channels and rolling topography. The presence of sandier crevasse soils generally means crops other than sugar cane, in the cane-growing section of the State.

49.6 Schwab, railroad stop.

50.8 End of striking crevasse topography.

51.7 Center of Morganza. Mississippi levee to right.

52.6 Cross south levee of Atchafalaya floodway. The region between here and the north levee is subject to artificial flooding when an extreme emergency demands its use, as a spillway.

57.1 Cross north levee of floodway.

60.0 Batchelor; situated on Lake Raccourci, another Mississippi cutoff lake.

61.8 R Old cotton and sugar plantation, now largely devoted to the raising of beef cattle.

62.0 Innis, stop on railroad and center of minor logging industry.

66.0 Observe the more extended dwellings of plantations devoted to cotton, corn, etc., as opposed to concentrated dwellings of sugar plantations.

67.1 Lettsworth. At right is Bayou Lettsworth, a long-abandoned channel of the Mississippi, now largely filled and supporting a growth of cypress trees and water hyacinths.
Note houses confined to levee crest; still dominantly of built-in-porch type; observe frequent occurrence of two front doors.

68.4 L Old crevasse channel.

R Negro church.
Road curves to the left, leaving Bayou Lettsworth and gradually descending the natural levee.

70.2 Local area of back-swamp.

73.1 Gradually ascending the natural levee of the Atchafalaya. Note increasing prominence of Red River soils, indicated by the red color.

73.9 L. & A. Ry. bridge over the Atchafalaya. The direction of flow is right to left; during flood periods the Atchafalaya carries approximately one-third of the Mississippi discharge.

74.7 Cross right-bank levee at Simmesport.

75.0 R Bayou des Glaises levee. In this section Bayou des Glaises occupies an old Mississippi channel. This section is subject to severe flooding; in 1927 the flood water was here six to eight feet deep.
Note so-called Spanish moss on the trees. Here as in other sections of south Louisiana the gathering of moss is an ever-present means of getting a little cash.

Professors Russell and Kniffen expounded the landscape, physical and cultural elements in association, descriptively and genetically, in a masterly fashion. Questions, wise and foolish, asked by members of the group, were answered by the two leaders not only with a patience but also with rare skill.

Under their inspiration the flat, and to the novice monotonously homogeneous, alluvial plains of southern Louisiana took on a lively variety, both in physical aspects and in associated human occupance features. Natural levees, crevasses, oxbow lakes, distributaries, former main river courses of several generations; Red River alluvium that really is red, in contrast to Mississippi alluvium which is gray; freshwater swamps, brackish water marshes; sugarcane fields, rice fields, cotton fields, pecan and orange groves; plantations old and not so old, small farms; French and American land divisions; house types of several kinds; muskrat trappers, shrimpers, oystermen; oil fields with their derricks and tanks and pipe lines and refineries, sulphur "mines" and associated shipping facilities; logging, saw mills; hamlets, towns, and New Orleans the metropolis—these and many other features were seen and enjoyed, not to mention French Creole food strange to most of the group but none-the-less delicious.

Rarely if ever have earnest professional geographers of all vintages and stripes had an opportunity to learn so much under skilled direction in so short a time, about an area varied and interesting. With thanks sincere and humility complete, all in the group salute our Louisiana guides and mentors.

WELLINGTON D. JONES.

University of Chicago.
January, 1941.

Titles and Abstracts of Papers, Baton Rouge, Louisiana, December, 1940

CARL O. SAUER.

Foreword to Historical Geography.

(Presidential Address. Published in full in this issue.)

A. C. ALBRECHT. (Introduced by Richard J. Russell.)

The Historic Indians of Louisiana.

The paper deals primarily with the economy and the habitat of the Historic Indians of Louisiana. Its purpose is to show the extent to which cultural development among the Indians in question has become modified by the physical landscape. Thus, the emphasis is laid upon the relations between the pattern of native economy and the given geographic conditions.

Some of the more important aspects which enter into the discussion are the Indian's mode of subsistence, his possession of particular methods of hunting or cultivating, and his use of certain raw materials in the manufacture of implements and the construction of houses.

Coastal tribes as well as those of the interior are being considered.

Although the study of the relations between economy and habitat is considered very significant, no sight is lost of the fact that cultures must ultimately be studied as an historical development.

W. T. CHAMBERS.

The Relation of Some Texas Soils to Their Parent Materials.

During recent years it has been contended that soil characteristics are not determined by the nature of the rock formations from which their mineral constituents were derived. It has been asserted that within a general climatic and botanic region soils tend to develop a uniform set of physical and chemical characteristics, and that when mature they have no significant characteristics that result from the nature of their parent materials.

This seems not to be the case at Nacogdoches where red land is residual upon Weches greensand, while both north and south of the city infertile gray colored sandy soils have developed from sand formations. In general the soils of eastern Texas are sandy and sour because they are derived from sandy, clastic, non-calcareous formations. Although most East Texas land is gray colored, the section is shown on some soil maps as an area of red and

yellow earths. The dark sandy loams of Fayette Prairie have developed upon calcareous sandy formations.

The clay soils of Blackland Prairie have developed from marls, chalks, soft limestones, and calcareous clays of the Gulf Cretaceous series. This soil crosses climatic and vegetation boundaries without apparent change, but it varies considerably from one rock formation to another.

The geological line separating the Comanchean and Gulf series of the Cretaceous is a conspicuous soil and geographic boundary. To the east lies Blackland Prairie—richest agricultural section of Texas, while westward the land is higher, eroded, and hilly, and has such thin stony soils that agriculture is generally impracticable, the land being used for grazing.

In north central Texas sandy land lies upon either side of Grand Prairie. The thin stony soils of the prairie rest upon resistant limestone, and are used chiefly for grazing. The sandy strips are known as the Cross Timbers. They have developed from sandy formations, and produce watermelons, peanuts, and deciduous fruits. The Central Mineral region, with its granite, gneiss, schist, sandstone and limestone, offers abundant evidence that soils are related to their respective parent materials.

To the academic objection that soils treated herein are immature, I reply that if these lowlands, with rocks ranging to pre-Cambrian in age, now have immature soils, we mortals need not debate what characteristics they will have when mature. It is more vital to study soils as they are.

PIERRE CRABITES. (Introduced by Richard J. Russell.)

Louisiana Foods.

The famed food of south Louisiana is not French. Rather it is indigenous to the area. The sea, the lakes, the fields provide the ingredients; leisure and inclination have developed great individual cooks, none of whom cooks by recipe. The dishes, in the main, are bourgeois rather than patrician. The one exotic element is the high seasoning, an importation from the tropics.

Time has effected changes. It is now possible to get good food over a wider area; the best suffers by contrast with that of fifty years ago. There were once many famous dishes based on wild game; they are now hardly more than memories. The prohibition era decreased the use of wines in cooking; the new generation of cooks can't learn to use them. There is a gradual supplanting of old dishes by new ready-prepared foods.

OTTO E. GUTHE.

Watershed Management in the Federal Flood Control Program.

Watershed management is the most recent legally recognized flood con-

trol activity of the Federal Government. Not until 1917 was the Government authorized to give significant attention to the flood problem and then only to levee construction. In 1928 the Government first assumed major responsibility for flood protection on the lower Mississippi and some of its tributaries. Preceded by several flood control projects initiated under special acts and under Public Works and Emergency Relief appropriations, the first nation-wide flood control program was authorized by the Omnibus Flood Control Act of 1936. This Act included a statement that the Federal Government should, for flood control purposes, improve or participate in the improvement of watersheds contributing to navigable streams.

Watershed management for flood control includes measures designed: (1) to protect and further the effectiveness of downstream engineering works by retarding excessive run-off and decreasing rates of siltation; (2) to reduce the deposition of erosional debris in river channels and upon productive bottom land; and (3) to curb the run-off contributed by tributaries not affected by storage reservoirs.

As a factor in flood control, watershed management has definite limitations set by the physical characteristics of the land and by the tendency of established economies to resist change. It is recognized that the effects of upstream improvements may be obscured by occasional major flood-producing storms, but at other times proper watershed management may be relied upon to reduce siltation and the concentration of floodwaters contributed by the numerous small tributaries to the larger streams. This paper reviews some of the problems of evaluating watershed flood control measures and indicates how these problems are being met.

ROLAND M. HARPER.

Human Geography of Lousiana.

Louisiana is one of the two states that is all coastal plain, but it is very diversified nevertheless. It was divided by Hilgard in 1884 into 13 regions, based primarily on soil and topography, and with minor modifications those can be used very well today. There are also marked differences in climate, vegetation and population, more or less correlated with the soil and topography.

Climatic factors of course do not change abruptly at the regional boundaries, but they are useful in describing the different regions. Vegetation was originally pretty closely correlated with soil, but has been greatly modified by human occupation. The distribution and composition of population are governed to a considerable extent by physical factors, but there are also historical factors involved, which are largely independent of present environment.

Broadly speaking, the northern part of the state is characterized by a wide fertile flood-plain along the Mississippi River, and low hills of reddish and yellowish loam farther west. The alluvial plain continues southward to the Gulf, and east of it in southern Louisiana are loess hills near the river, and sandy long-leaf pine country farther east. West of the river in the southern half of the state are more long-leaf pine country, extensive prairies, and wide marshes bordering the coast. Good water is abundant in northern Louisiana, but geological conditions southward are such that many of the inhabitants use cisterns instead of wells; and this seems to have an important influence on the prohibition vote.

The climate is mild-temperate throughout, but the proportion of summer rain increases southward, and near the coast the winters are as mild as in northern Florida, in the same latitude.

The people of northern Louisiana are much like typical southerners, but in southern Louisiana there is a large French and Catholic element, with different traditions, and French is still spoken by many people, and used in a few local newspapers. Various kinds of differences in population in the several regions are shown in the statistical tables.

J. W. HOOVER.

Cerros de Trincheras Sites in Southern Arizona.

The Papago country of Southern Arizona is a marginal area from the standpoint of human occupance. Evidence of prehistoric occupance of the region consists chiefly of a number of fortified hills with defense walls and rock terraces for house sites, called by the Mexicans *cerros de trincheras.*

Cerros de trincheras, described by Sauer and others, occur in greatest number and on grandest scale across the border in Sonora. Seven lesser examples are located in the Arizona Papagueria. The occurrence of the same structural elements in the Arizona sites as in the Sonora sites suggests that the latter are of same culture but peripheral outliers. These elements occur in varying proportions and arrangements according to the importance and morphology of the sites. Most important are: (1) walled terraces filled flush with rubble; (2) crosswalls in some of these, suggesting rooms; (3) low circular walls and small diameter, evidently house sites; (4) breastworks and low roughly constructed walls across vulnerable stokes or approaches.

The types of construction and their arrangement on the hill sites in Arizona, as well as in Sonora, are indicative of the defense motive. A distinct type of pottery decoration suggests that the *trincheras* builders were unrelated to the present day inhabitants, and occupied the region prior to 1200 A.D. However walled fortifications are characteristic of the area and the

last ones were undoubtedly built by the ancestors of the Papago and as late as 1400 or after.

The *trincheras* builders undoubtedly supported themselves, as did the Papago when the white man arrived, largely by farming patches in suitable sites where flood waters could be spread over the fields. In all these sites one then naturally looks for the nearest areas where fields could have been feasibly located with reference to needs of soil and water.

Two of the *cerros de trincheras* are located near important present villages and fields and just likely their occupants tilled the same areas. The inhabitants of the other sites very likely had fields in situations where there are few or no fields today. One need not look to present field sites for the location of the fields which sustained the *trincheras* dwellers. Within historic time many old sites have been abandoned and new ones developed, by the Papago Indians, chiefly because of erosion and sedimentation.

Present day fields are mostly located in a belt of alluviation which is transitional between the bahada slopes and the flats of the major washes. The *cerros de trincheras* tend to be located near these belts. The greatest distance between *trincheras* sites and likely field sites is no greater than that traversed by the Papago Indians between fields and reserve villages located with reference to dependable water.

PRESTON E. JAMES.

Expanding Settlements of Latin America—The Statement of a Problem.

A survey of the distribution of people in Latin America and the relation of people to the land brings to light an important but not generally appreciated fact regarding the pioneer zones. There are only four regions of mainland Latin America (excluding the Islands of the West Indies) where pioneer expansion is taking place around the margins of a zone of concentrated settlement without an accompanying decrease of population in the centers of these zones. In most parts of Latin America the frontiers are "hollow" because pioneer movements are recruited by a depopulation of the older areas of settlement. But in four regions population increase in the center is sufficient to support a pioneer expansion around the margins. In these four areas also population increase is not supported by immigration. The four areas are (1) the Highlands of Costa Rica, (2) the Antioquia district of Colombia, (3) Middle Chile, and (4) the three southern states of Brazil.

This paper presents a statement of the problems involved in an historical and geographical study of the underlying factors leading to expanding settlements in these four areas.

RAYBURN W. JOHNSON. (Introduced by J. R. Whitaker.)

Truck Farming in the Northern Part of the Cotton Belt—Gibson County, Tennessee.

Land utilization in Gibson County, Tennessee, presents a rather unique picture of man's occupance and use of an agricultural area. Although this county lies on the inner margin of the Cotton Belt and stands second in cotton production in Tennessee, there is in its southeastern half an area of about 250 square miles which is known nationally for the 2,000 to 3,000 carloads of strawberries and vegetables it exports annually. The maps made for this paper show that neither the cotton nor the corn acreage falls off materially in the truck farming half of the county where 10,000 to 15,000 acres are used for truck crops each year.

Since the Coastal Plain deposits were laid down in Gibson County, they have been covered with a layer of loessal material five to nine feet thick. On the undulating surface of the truck farming area, which is drained by three streams, numerous small tributaries have carved a network of small linear depressions or draws. The floors of the draws are flattish, and are generally from 100 to 1,000 feet wide. Although the soils are all silt loams, they fall into two major groups, bottom land soils and hill and slope land soils. The hill and slope land soils have been divided into five sub-types and the bottom land soils into four sub-types by the soil specialists of the local soil conservation district. Cabbage and tomatoes are bottom land crops whereas strawberries, sweet potatoes, and most of the other vegetables are hill and slope land crops. The patches of soil which have good aeration and good drainage, and which warm up early in the spring are utilized for truck crops whereas the less desirable soils are used for cotton, corn, and other forage crops. In addition, one or more of these crops is usually included in the truck crop rotation.

The truck-farming area is traversed by three railroads and an equal number of national highways. Although the highways are relatively new, the railroads were built just after the Civil War, the same period when truck farming began in the area. Within twenty-four hours, fresh strawberries and vegetables can reach northern and eastern cities either by train or by truck. Strawberries were the first truck crop grown in the area by two immigrants from Maryland. From these two men some of the natives learned how, and soon the other truck crops were introduced. The present growers have had years of experience in producing these highly specialized and perishable products which, without question, require considerably more knowledge and skill than do cotton, corn, and hay. Because of fluctuations in the price and production of cotton on the one hand and of truck crops on the other hand, some of the land is marginal in usage and shifts from one use to the other as the net income changes.

WELLINGTON D. JONES.

Age of Moraines in Alberta along Fifty-four North.

In Alberta west of Edmonton the gap between westernmost Keewatin till and easternmost Cordilleran till (age of neither determined, but perhaps Wisconsin) is not more than 25 miles. Identified as "Young Drift" Wisconsin because rough in surface configuration, dotted with lakes and ponds and marshes, with little or no postglacial dissection, and without deep weathering in till are Duffield Moraine (west of Edmonton), Buffalo Lake Moraine (east of Edmonton), Viking Moraine (east of Vegreville), the moraine south of Innisfail between Calgary and Edmonton, and the moraine east of Medicine Hat. "Young Drift" Wisconsin age ice sheets from the Keewatin center therefore appear to have extended west and south at least to a line connecting a) Duffield moraine west of Edmonton, b) moraine south of Innisfail, c) moraine east of Medicine Hat, d) Altamont Moraine in southern Saskatchewan, northeast Montana, northwest North Dakota.

In the only published paper discussing age of Alberta moraines along 54° N., Warren and Rutherford say of the Viking Moraine, which they map as extending from east of Vegreville southward to east of Medicine Hat: "it must be older than . . . Wisconsin . . . probably . . . Illinoian or . . . Iowan." In the United States, Iowan is by Thwaites and others judged to be "Old Drift" Wisconsin, specifically "Sub-stage 1" of five recognized Wisconsin sub-stages. Warren and Rutherford further suggest, with reservations, that Buffalo Lake Moraine may be Nebraskan, Duffield Moraine may be Kansan in age. On the basis of landscape aspect as observed in the field in September, October, November, 1936, subsequent study of Canadian and United States topographic sheets, and inspection of air photographs of Alberta moraines, of Altamont Moraine in North Dakota, of "Iowan or Illinoian" in Montana, the author of this abstract concludes that Warren's and Rutherford's age determinations are incorrect.

The significance to geologists (including geomorphologists) of the age of Alberta moraines is obvious.

Anthropologists are interested in knowing when there was and was not an ice free and climatically suitable route east of the Rockies in Canada for migration into southwestern and southeastern United States of prehistoric peoples from Siberia via Alaska. Age determination of Alberta moraines is part of the answer to this question.

Soil profiles in Mid-West United States differ with age of till sheets, specifically on "Young Drift" and "Old Drift" Wisconsin and Illinoian. Soil men in Alberta have as yet not recognized soil differences corresponding to age differences in moraines.

Geographers cannot ignore the question of age of moraines in Alberta

because land types and their use potentialities may be found to correlate with soil profile differences on moraines and associated till sheets of different ages.

J. S. KYSER. (Introduced by Richard J. Russell.)

Louisiana Demography.

After initial difficulties early in the French colonial period, the population of Louisiana increased continuously. Although the largest absolute number increases were recorded in the twentieth century, the highest percentage growths were experiencd almost exactly a century earlier. There has been great areal differentiation in density, rate, and continuity of population growth both in the rural and urban sections. Until approximately twenty-five years ago, these differences were explained largely by dissimilarity in surface conditions of the several geomorphic provinces, but in the last two decades, subterranean mineral wealth increased its influence both in extent and intensity.

Because of her relatively small total population, and the possession of the South's largest city, Louisiana was long the most urban state in the Deep South. Although this primacy was surrendered in 1930, general urban growth continued. During the two decades of 1920 to 1940, percentage increases were especially large in the smaller cities, several of them doubling and even trebling their populations during the decade of 1920 to 1930.

Fluctuations in population trends in the various portions of the State reflected not merely natural difficulties of floods, soils, etc., but man-made crises as well. The decade of 1860 to 1870 recorded population declines in more than half of the parishes; the greatest proportionate ones occurred in those sections of the alluvial bottoms and the upland coastal plain where the sugar and cotton plantation systems were most firmly established. Recovery was achieved in many parishes, but in several, growth and decline have alternated during the last seventy years.

Negro population constituted half or more than half of the State's population from 1810 to 1890, since which time it has declined to approximately one-third. Concentration of negroes has been largely in the riparian parishes of the Mississippi River in the Atchafalaya and Tensas basins as well as in the alluvial trench of the Red River plus several parishes bordering it.

Although the Anglo-Saxon and Latin cultural realms are readily distinguished in many respects, both have been similar in that, until recently at least, they exhibited an essentially frontier fecundity. Economic forces centering basically in the recovery of sugar cane and especially the widespread mineral activities have been essentially responsible for the recent significant population increases in South Louisiana from the Sabine to the mouth of the Mississippi.

Two-thirds of the parishes that lost population in the decade of 1920 to

1930, largely because of exhaustion of timber and of agricultural misfortunes, recovered sufficiently in the decade of 1930 to 1940 to more than eliminate the losses of the preceding decade. All the evidence points to a continuing marked dynamism in the evolution of the Louisiana population pattern.

HAROLD H. MCCARTY. (Introduced by Preston E. James.)

The Market Functions of Villages in Eastern Iowa.

The Iowa village is essentially a market town, a place in which the produce from neighboring farms may be sold and in which goods and services needed by farm families may be purchased. In addition, it serves as a social, recreational, religious and educational center for the isolated farmsteads of the surrounding community. In the past, the village performed these functions almost exclusively for the members of its community who had few contacts in other areas. More recently, the automobile and improved road have extended the radius of contacts by farm families and increased the frequency of their visits to larger and more distant centers. In consequence, many former village functions have been curtailed. By 1935, it had become apparent that the villages had lost most of their former importance as markets for livestock and as sources of the more expensive types of clothing and similar items of "shopping goods."

The extent and nature of these town-and-country relationships have been traced statistically and by field observation in a section consisting of four counties in eastern Iowa. In that section the areas served by villages vary considerably among various types of functions. The larger cities appear to be extending their patronage areas for all types of services, but more particularly for shopping goods. Groceries are among the commodities most likely to be purchased by farm families in the neighboring village, but even these functions have been largely eliminated within a radius of from 10 to 12 miles of the larger cities. No readjustment of location patterns was observed among these villages; the most important ones still lie along the major railroads, whose routes, in turn, show a considerable response to the topography. The climate and soils of this section favor the growing of corn and the feeding of meat animals. Most of the farms are of the animal-speciality type and practically all farms are highly specialized in production for the market rather than for use. The agricultural economy requires relatively elaborate distributive institutions whose nature is essentially urban. The tendency for these institutions to migrate from the smaller to the larger towns appears to have been facilitated by changes in technology, particularly improvements in transportation facilities; but the actual loci of these changes have been determined very largely by the conditions of the physical environment.

K. C. McMURRY.

The State Public Domain in Michigan.

Public ownership of land in Michigan has increased very rapidly in recent years. Together with the Federal ownership, approximately one-third of Northern Michigan is now public property. This condition raises many questions and problems, most of them unexplored.

Tax delinquency has been the major factor responsible for the state public domain. The operation of the tax laws is of interest here, and in other similar regions.

Public policies directed toward the public domain and associated privately owned lands, such as, fire control, reforestation, wild life, recreation, agriculture, etc., require reexamination and development. A geographical approach to these problems gives some promise of providing useful results.

PEVERIL MEIGS, 3RD.

An Ethno-Telephonic Survey of French Louisiana.

The distinction between the French and the Anglo-Saxon areas is of primary importance in the cultural geography of Louisiana. Though the Louisiana French retain a distinct language and culture, their distribution cannot be ascertained from the United States Census because their ancestors settled in Louisiana 175 to 225 years ago. The Census goes back only one generation in recording foreign elements.

The present paper delimits the Louisiana French area through the use of maps based upon analysis of telephone directories. The ten leading names in each of 115 Louisiana directories were listed, and the percentage of French names in each list was calculated and mapped, with isopleths. The French area stands out distinctly on this map. In a large core of the French area the lists are 100% French. The primary French area coincides roughly with the lower Mississippi and Red River delta and flood plains, the "prairie" of southwestern Louisiana, and the coastal marshlands. A secondary strip of high French percentage appears farther up the Red River.

In some districts where "telephonic blanks" prevail, the percentages and limits of French were estimated by a field check of names on rural mailboxes and styles of mailboxes.

Texas directories show that the southwestern corner of the Louisiana French is sending offshoots into the adjacent part of Texas. At the southeastern corner of the Louisiana French area, in New Orleans, the French element has become largely submerged by the English. Comparison of directories at intervals of several years would clarify trends along all borders of the area and in intrusive "islands" within the area.

Clues to some regional cultural differences within the area of Louisiana French were provided by current directories. The proportions and regional distribution of two strains of French, the "Creole" (early French) and the "Cajun" (French-Canadian Acadians), were mapped on the basis of current directory names checked against lists of early residents of the Acadian homeland.

Disproportionately large numbers of extraneous culture representatives appear in certain lines of activity in the Louisiana French area. Physicians of Anglo-Saxon origin predominate even in the heart of some strongly French districts, no doubt a reflection of past educational handicaps of the French area. Italians, statistically insignificant in the total population, dominate the grocery business in some sections.

The general method outlined should be useful in localizing problems of relationships between population backgrounds and culture landscapes.

V. J. PARENTON. (Introduced by Richard J. Russell.)
French Louisiana.

When the United States acquired the territory of Louisiana (1803), the population of the southern portion of the present State was predominantly French in descent and culture. Today the descendants of these peoples are still the dominant ethnic element in rural south Louisiana. Culturally, these people have distinct differentiating characteristics from the inhabitants of Louisiana who are mainly of Anglo-Saxon extraction. Because of the different ethnic basis and cultural contrasts existing between the two sections of the state, south Louisiana is generally called "French Louisiana." It should be pointed out however, that this term is based more on culture than on national origin. In the course of a century the French element has either assimilated or acculturated significant extraneous ethnic groups of Spaniards, Germans, Dutch, Irish, and "Americans." The more important cultural characteristics which differentiate "French Louisiana" from the remainder of the state's native white population are: the use of the French language; the Catholic religion; form of settlement; pattern of land division; types of recreation; and food habits. In general the major part of the French culture area resembles a triangle whose base is the shore line of the Gulf of Mexico. The western side is roughly bounded by a straight line running from the southwestern corner of the state to the junction of the Red and Mississippi Rivers, and the eastern side is roughly bounded by a straight line stretching from the latter point to the Gulf. Falling outside of this triangular area is the considerable French population living in Avoyelles and Natchitoches Parishes, as well as in scattered communities along the Red River. After a careful investigation, Smith has estimated the number of

Louisiana French to be 565,000, or 44 percent of the state's native white population. Of this number, it is believed that the descendants of the Acadians account for nearly three-fourths of the total French element. This paper treats briefly of the historical background, sources of the population, the main cultural characteristics mentioned above, and the process of acculturation in "French Louisiana."

ROBERT S. PLATT.
Problems in the Cultural Geography of Latin America.

Plantations.
Forms of Land Tenure.
Generalizations on Land Tenure and Economics.

J. FIELDING REED. (Introduced by Richard J. Russell.)
The Soils of Louisiana.

The soils of Louisiana are grouped according to similarity of profile characteristics and parent material into the following general divisions:

1. Red River Bottom Soils.
2. Mississippi River Bottom Soils.
3. Mississippi Bluff and Terrace Soils.
4. Coastal Plain Stream Bottom and Terrace Soils.
5. Coastal Prairie Soils.
6. Coastal Plain Soils with Well Drained Subsoils.
7. Coastal Plain Soils with Poorly Drained Subsoils.
8. Coastal Plain Flatwoods Soils.

Fundamental differences between the divisions are pointed out and profiles of soils typical of several of the divisions are illustrated by slides.

J. W. REID. (Introduced by William T. Chambers.)
Livestock-Timber Farms in the Arkansas Ozarks.

In the Ozark Plateau in North Central Arkansas, remote from large cities, the farmers have developed a type of agriculture in harmony with the rural and backward area. The land is rough and timbered and livestock raising furnishes an important source of income. This study was made in 1938 of 201 livestock and timber farms in the region.

The total farm acreage was above the state average, but the crop acreage was quite low considering that only extensive cultivation was practiced and that they were farms on which feed was needed. The land not in crops (comprising 80 per cent of the total) was in timber and in unimproved pasture.

The investment in farm business was small, the average total being but

$5,000, and the proportion of that invested in buildings and equipment was a surprisingly low figure. Only one-third of the farmers had automobiles and there were but five tractors on the 201 farms.

Mixed beef animals were the principal type of cattle raised. The milch-cows on the farms were of such poor quality that they could scarcely be distinguished from the other cattle. The widespread practice of allowing stock to run at large on poor, wooded pastures has made improvement in the quality of the stock a slow process.

The average cash income in 1937 was less than a thousand dollars and this was derived principally from the sale of livestock and its products. The cash income from crops was a very small part of the total and the cash receipts from timber made up an even smaller part of the total. The farmers interviewed expressed no interest in the development of the timber enterprise on the farm.

The farmer with his frontier type of philosophy has used the timber as if it were inexhaustible with no idea of conservation, and has let his stock run at large on the theory that stock raised and sold with essentially no expense cannot fail to yield a profit no matter how small.

With the depletion of the forest and the erosion of the cultivated hillsides, a standard of living comparable to that enjoyed in the past cannot be maintained without definite improvement over the farming practices used in the past.

J. Harvey Roberts. (Introduced by Richard J. Russell.)

Louisiana Animal Geography.

Faunistic regions are best indicated by the kinds of animals restricted to those regions, but they are also distinguished by the absence of certain species which are nearly cosmopolitan. The presence or absence of a species may be attributed to factors affecting the animal directly, such as temperature, salinity, and humidity, or to factors affecting the animal indirectly, such as food, shelter, and human habitation.

The coastal marshes and islands comprise the most distinct faunistic region of the state. The familiar animals are the Brown Pelican, Boat-tailed Grackle, Louisiana Heron, Diamond-backed Terrapin, Fiddler Crab, and the Queen Butterfly. Conspicuously absent are the otherwise cosmopolitan Bullfrog, Box Turtle, and Crayfish.

The inland territory is comprised of alluvial bottom lands and heavy swamps along the rivers; and the prairies, pine flats, and uplands which tend to grade into each other. The familiar animals of the bottom lands are the Bullfrog, Alligator, and Wolf. Those of the uplands are the Gray Fox, Pocket Gopher, and, in restricted sections, the Chipmunk. Rivers as such

are not believed to be very effective barriers, for it is evident that animals willing to live in the alluvial areas bordering them can find means, active or passive, for crossing streams. The extent of these alluvial areas, however, may act as a barrier. The "invading" Armadillo and Pocket Mouse are apparently hindered in their spread toward the east by the bottom lands of the Mississippi and the Red River. In a like manner, certain northern and eastern forms may be hindered in their attempts to extend their ranges.

RICHARD J. RUSSELL.

Physiographic Regions of Louisiana.

Flat regions are not necessarily devoid of physiographic complexity. Recent surfaces of deposition, such as the floodplains and deltaic coastal plain of Louisiana, exhibit an amazing variety in land and drainage forms and patterns. Approximately one-half of Louisiana is in this category. The remainder of the state is about equally divided between surfaces of Tertiary bed rock and Pleistocene terraces. The terraces retain, in more and more subdued expression on earlier levels, floodplain and deltaic coastal plain characteristics. Tertiary surfaces present considerable topographic diversity related to individual outcrop belts. In general the clay and shale belts form lowlands which are separated by cuestas of more resistant rocks.

R. J. SAVILLE. (Introduced by Richard J. Russell.)

Agricultural Regions of Louisiana.

The agricultural regions of Louisiana are usually designated as type-of-farming areas. Within each type area further differentiation may be made between farms, according to the systems of farming followed. Thus "type" determines the broad area divisions, and "system" the nature of the enterprise combinations in each "type." The relative rank of these enterprises together with the relation of agricultural land to the entire land resources describes the type of farming prevailing.

In broad outline Louisiana may be divided into five major agricultural regions: 1) Cotton, with its subdivisions into Upland, Alluvial, Bluff, and Coastal Marsh areas; 2) Sugar cane; 3) Rice; 4) Strawberry; and 5) New Orleans market area. In the delta areas of the Red River and Mississippi there is marked concentration upon cotton production for the sole cash income. The bluff areas have sharply differing conditions relative to the importance of cotton production. In the upland cotton areas self-sufficiency in farm operations plays a very important part. The lower Mississippi delta forms the main area known as the "Sugar Bowl." The farm organization is of two kinds: large plantations, and family farms. The strawberry area has developed largely along the Illinois Central Railroad; the farms

are usually very small in size and there is high concentration upon strawberries as the only important source of cash income. The New Orleans market area includes a variety of rather highly developed specialized systems of farming; there may be mentioned citrus production, the city dairies, and the raising of truck crops for the French market.

FOREST SHREVE.

The Vegetation of Northern Mexico.

There are six major types of vegetation in Mexico north of the Tropic of Cancer. There are also three minor types and five intermediate types which exist as transitions between the major ones. The natural plant cover of the eleven states of northern Mexico is chiefly comprised in the five major types: desert, arid bushland, grassland, evergreen oak forest, coniferous forest and thorn forest. These types are briefly described, their areas shown, and some of the physiographic and climatic conditions indicated which appear to be responsible for their distribution. A few of the many cases are cited in which local conditions of soil or underlying rock modify the character of the vegetation.

H. THOMPSON STRAW. (Introduced by Preston E. James.)

The Settlement Pattern of the Western Highland Rim Plateau of Tennessee.

The Western Highland Rim Plateau of Tennessee is the upland between the Central Basin and the Plateau slope of West Tennessee. Its summit levels represent the Tertiary peneplain, subsequently uplifted and dissected. The plateau character is not readily discernible. Rather it seems to consist of youthful, flat-topped ridges interspersed with river valleys, the larger of which are mature with well developed valley flats.

Settlement was accomplished in the early nineteenth century by farmers. They chose the flat land of the valley bottoms, with their richer soils of recent alluvium. Subsistence pioneer economy was maintained long after it disappeared from the adjacent lowland areas with their better transportation.

The early development of the mineral industries in the region was in the valleys. The two minerals of greatest importance were blue phosphate rock and limonite. The phosphate rock usually lies well below the ridge top, and therefore the valleys were the sites of most of the mining. The mining of iron ore tended to produce valley settlements. The ore is often associated with the St. Louis limestone which caps the ridge top, but since it required washing before smelting, the settlements were in the valleys where water was available.

Most settlements are still in the valleys. Main roads have tended to

cling to the ridge tops for they were designed to cross the region, not to serve it. Ridge-top roads and valley settlements have meant difficulty in marketing, low standards of living, large relief loads, and low tax returns. Valley settlements have precluded easy expansion of farmland. The adjacent slopes are so steep that soil erosion has checked many attempts to add improved land.

Ridge-top settlements are largely restricted to the eastern part of the region. Factors establishing this pattern are cash crops—dark fired tobacco in the north and cotton in the south—and the colonizing by German Swiss. Both cash crops can be grown on the valley floors but the farmers prefer the upland soils. In cotton-growing they fear that the valley soils will be slow to warm up in the spring and shorten the growing season. In the north they believe it easier to produce the heavy-bodied tobacco demanded by the Clarksville market on the upland soils. The German Swiss were established by land agents on ridge-top land purchased because it was cheap. Many have migrated, but a road pattern similar to that of the Northwest Territory and a description of land titles essentially a modification of the range-and-township system of survey remain.

The pattern of settlement underlies the problems of land use. Conditions of surface soil and possibilities of forest and mineral exploitation must be taken into account, but the existence of the pattern and its relation to roads, established schools, and other public services must also be studied.

THORNTHWAITE, C. W., and C. F. S. SHARPE and EARL F. DOSCH. (Introduced by C. W. Thornthwaite.)

Climate of the Southwest in Relation to Accelerated Erosion.

Various observations presented as evidence of climatic change in the Southwest are critically examined. The conclusion is reached that climatic changes are so slow that during a 2,000-year period they would be completely overshadowed by random year-to-year fluctuations. Physiographic observations of valley terrace or bench remnants and buried channels, and the distinctive fill material in which they are formed, indicate that these result from normal processes of erosion and sedimentation under an arid climatic regimen and do not constitute evidence of climatic change. The disastrous accelerated erosion of the last half century is not due to climatic change but to misuse of the land by man. Thus, intelligent action to reduce the irritation, increase the protection to the surface, and reduce surface run-off and loss of water will go far toward the control of accelerated erosion and the rehabilitation of the region.

GLENN T. TREWARTHA.

The Unincorporated Hamlet: An Analysis of Data Sources.

Among American settlements elements the unincorporated hamlet represents the first hint of thickening in the settlement plasm. It is neither purely urban nor purely rural, but neuter in gender. Probably in part because of its amorphous character the hamlet has received little attention from students of settlement, and this in spite of its ubiquitous character.

Within the past decade or so a relatively few writers, mainly sociologists, have published settlement studies in which the problem of the survival of the American hamlet has been touched upon. In all of the studies Dun and Bradstreet's Reference Book of commercial ratings was the principal source used in determining the change in number of unincorporated places from decade to decade. Data from Rand McNally's and Cram's atlases were used by some for comparative purposes. All of the studies using Dun and Bradstreet as a source arrive at the conclusion that hamlets are declining in number and population.

As a result of (1) comparing the data on hamlets from the three published sources named above for 12 counties in southwestern Wisconsin for 13 irregularly spaced years between 1892 and 1940, and (2) comparing the data on hamlets from the three published sources with data obtained from a field study of hamlets within the same region, I am obliged to conclude that the sources are unreliable in their hamlet counts.

STEPHEN S. VISHER.

Excessive Rainfalls as a Serious Handicap in the South.

Rainfalls of conspicuous intensity are relatively frequent in the South. For example, ½ inch of rainfall within 5 minutes falls in ½ of the years, on the average in the South, or 5 times as often as in Wisconsin and Indiana. An inch of rain falls in 10 minutes once in about 7 years, on the average, in the South, but less than 1/7 as often in the North. Two inches in a half hour falls once in about 7 years in the South, about 1/10 as frequently in the North. The South has a 3-inch rain in 2 hours once in about 5 years, the North, once in 50 years. Five or six inches of downpour occur in 8 hour periods once a decade in each part of the South, but less than once a century in the North. The South has falls of about 8 inches in 16 hours 4 times a century, while the North in a century has maxima of less than 5 inches.

Maximum 24 hour rainfalls average more than twice as large in the South as in the North as to the more frequent big storms, namely those which occur once in 5 years. As to big storms, those that occur on the average only once a quarter-century, the South's maxima is 3 times as great as the North's. While the North has few rainfall records of more than 6 inches in 24 hours, the South has many of over 12 inches in 24 hours and at least five of over 20 inches (New Smyrna, Fla., 23.2; Taylor,

Texas, 23.1; Altaposs, N. C., 22.2; Alexandria, La., 21.4; Montell, Tex., 20.8).

In periods of somewhat less than 24 hours some astonishing amounts have fallen, for example 23.1 inches in 15 hours (Taylor, Texas), 13.5 inches in less than 3 hours (Beaumont, Texas), 9.2 inches in about 30 minutes and 11.2 in 45 minutes (Guinea, Va.).

Very large totals of rainfall within a few hours are widely scattered over the South from Texas to Maryland. They occur in most of the months of the year. Excessive rains are almost unknown in the North during the five cooler months (Dec.–April) but occur annually during each of these months in the South.

The more frequent heavy downpours of the South and the greater totals received, and the fact that many heavy rains occur during the cooler months when runoff is especially great, helps to explain the fact that soil erosion is especially severe in the South.

(Numerous precise data were given; several maps showing the relative frequency in the U. S. of various types of downpours were shown; explanations of the contrasts were offered.)

LEO WAIBEL. (Introduced by Isaiah Bowman.)

The Plantation System in Latin America.

Proceeding from the definition of the plantation as an agricultural and industrial enterprise which, at great expense of labor and capital, raises highly valuable agricultural products for market, two different types of plantations were distinguished in Latin America: those which produce for local markets and those which produce for the world market. While the latter are located along the railway lines and motor roads running to the main harbors, the former are to be found as far in the interior as there are population agglomerations. Sugar-cane and the production of raw sugar and alcohol is the main purpose of all of these interior plantations. Only where population is dense and the economic life highly variegated, are other plants such as coffee, cocoa and tobacco a part of the plantation economy (Mexico, Colombia, Peru and Bolivia).

Turning to those plantations which produce for the world market, four different plantation areas were distinguished on the basis of their age and the character of their dominating product.

The oldest plantation area is *northeastern Brazil* where sugar production, based on negro-slave labor, started in the 1530's. As early as the first decades of the seventeenth century sugar production was so important in this area that it supplied the entire demand of the European market.

About 1650 the plantation system entered *Guiana* and the *West Indies*

and changed the entire social and racial structure of these islands. In the smaller Lesser Antilles sugar-cane soon was raised as a kind of monoculture, while in the larger Greater Antilles different types of agriculture were developed. In French Haiti the purpose of the plantation economy turned toward the end of the seventeenth century to other products than sugar, namely coffee, cocoa, cotton and indigo.

The negro revolt in Haiti in 1789 and the abolition of slavery in the English colonies in 1833 shook the plantation system to its very roots and caused a migration into other areas. Then for the first time the plantation system reached very significant proportions on the Spanish island of Cuba where in addition to sugar-cane coffee become a plantation product.

Coffee cultivation now also spread to the *continent* and plantations developed in Venezuela and Colombia as well as in Ecuador, Central America and Mexico. Thus originated a third large plantation area in tropical America which differs in three main points from northeastern Brazil and the West Indies: it is more remote from Europe, it has been settled entirely by Spaniards, and its labor depends almost entirely on Indians and mestizos. Toward the end of the nineteenth century, two plants became the object of the plantation economy because of an increasing demand of this country: bananas and sisal hemp. The location and the structure of these two types of plantations, however, are fundamentally different.

In addition to the three aforementioned plantation areas of tropical America there is still one more producing for the world market; it is the most recent of all, the most remote, and the smallest, namely *Peru*. However, the commercial products of this area are not the modern plants of world agriculture such as bananas or coffee, but rather the old colonial sugar-cane and cotton. This is due to the climatic conditions of the coastal desert as well as to two political factors: the Brussels sugar convention of 1902 and the opening of the Panama canal in 1914.

E. M. West. (Introduced by Richard J. Russell.)
Louisiana Vegetation Regions.

The mild climate, moist atmosphere, location and soil conditions have rendered Louisiana favorable for the development of a rich and varied vegetation and which may be conveniently split up into the following phytogeographic divisions:

1. The "marsh lands" which extend along the whole southern border of the state, and range in salinity from typical salt, through brackish, to fresh water marsh, each with its characteristic vegetation.

2. The "flat woods" located in southeastern and southwestern Louisiana.

The characteristic vegetation being longleaf-slash pine in the eastern section and longleaf pine in the western section.

3. The "longleaf pine uplands." Located in the west central, and central parts of the state as well as in the southeastern part just north of the flat woods area were dominated by longleaf pine.

4. The "prairies." The most extensive prairies of the state are in the southwestern part, but there are many small ones scattered throughout the state. The dominant vegetation of these prairies are various grasses and sedges.

5. The "pine-oak uplands" are located in the northern part of the state. The dominant vegetation is shortleaf and loblolly pines, associated with various oaks and hickories.

6. The "upland hardwoods" are located on the uplands bordering the Mississippi River valley and consist of a mixture of various hardwood species.

7. "Bottom land hardwood-cypress." These forest types occupy the alluvial land of the state.

J. Russell Whitaker.

Memoir of Almon Ernest Parkins.

(Published in full in this issue).

Clifford M. Zierer.

Melbourne as a Functional Center.

Melbourne's undisputed position as the chief city of Victoria and its co-ordinate position with Sydney among the capitals of Australia bear significant relationships to facts of general location and site. Melbourne's functional attributes are also clearly evidenced by the nature and importance of its principal urban forms.

Located at the head of Port Phillip Bay, Melbourne is at the approximate center of the rich coastal lowland of Victoria which extends about 150 miles to both the east and west. Low gaps in the Dividing Range, some 35 miles to the north of Melbourne, afford easy routes to the productive interior of the continent. Situated at the natural focus of land routes serving productive agricultural areas and on a suitable harbor about 500 miles from both Sydney and Adelaide, Melbourne has attained outstanding industrial and commercial significance.

The mass pattern of Melbourne consists of a non-concentric form draped about the head of Port Phillip Bay. Ample lands are available for all types of urban development. The commercial and administrative core occupies a well-drained tract of land selected by the first settlers along the

Yarra River about two miles north of the bay head. Large tracts of poorly drained lowland bordering the lower river are devoted to industries and shipping. Extensive residential suburbs have spread principally to the east and southeast upon an area characterized by varied relief, sedimentary rocks, good soils and scattered forest. The basalt plains to the north and west have been less attractive for residential use because of thin soils, rocky surfaces, sparse vegetation and monotonous relief. A series of entrenched stream valleys notably interrupt the continuity of Melbourne's urban pattern.

Melbourne is basically a manufactural and commercial city as evidenced by widespread urban forms devoted to those activities. Marked localization of many of those functions illustrates the capitalization of both regional and site advantages. The older residential districts bordering the commercial core are being steadily absorbed by the increasing numbers of light industries and by the expanding central commercial district. Shoe and textile factories form significant groupings in the decadent inner suburbs. Heavy industries, offensive types and those especially dependent on water and rail transport are generally concentrated on or near the lowlands at the head of the bay.

Shipping facilities are concentrated mainly along the lower Yarra River rather than upon the bay front. Continual dredging of the river and bay channels has been necessary to maintain direct contact with Melbourne's established warehouses and factories.

Finally, it must be recognized that the early designation of Melbourne as the capital of Victoria did much to guarantee its large future growth in a continent devoted to the general policy of concentrating most urban activities in the governmental centers.

Exhibits at the Baton Rouge Meeting

In view of the emphasis on a long field excursion, made possible by a gathering in the far South, it is natural that the exhibit of maps and other graphic material was small.

Aside from the showings of the commercial firms, the display was confined to illustrations of research of men who did not otherwise appear on the program.

Leonard S. Wilson displayed the originals of diagrams covering Latin-American trade, since published in the *Geographical Review*. Arthur H. Robinson and Shannon McCune presented a physiographic diagram of Korea. Two exhibits dealt with the northern frontier of North America: The North Bay Region of Ontario and the Middle Piscataquis Valley of Maine, contributions of Paul W. Icke and Clyde F. Kohn, respectively.